VOLUME 56

The JOURNAL of the AMERICAN OSTEOPATHIC ASSOCIATION

Jan. 1957

Osteopathic Research: I. M. Korr

Educational Supplement

New! From the Mayo Clinic

Clinical Examinations in Neurology

This practical guide tells you just what steps they take at the Mayo Clinic to arrive at a precise diagnosis of nervous diseases. Here you will not only find the step-by-step techniques for every examination method, but also the relation of each to the anatomy, physiology and disease of the area tested.

Instructions are given for obtaining a complete and useful history—*what questions to ask a patient suffering from headache, pain or convulsions*—and *how to appraise his answers.* You'll find descriptions of the forms used at the Mayo Clinic for recording the history and results of clinical examination. *Sample filled-in forms* are included in a pocket in the back of the book. Helpful clinical tests useful in the evaluation of the patient's symptoms are then described. Each of the 12 Cranial Nerves is considered individually with a brief review of anatomy, techniques of examination and interpretation.

Helpful chapters discuss electro-encephalography and electromyography. Biochemical and pharmacologic aids to diagnosis are detailed. Hazards, benefits and techniques of lumbar and cisternal puncture are described.

By Members of the Sections of Neurology and Section of Physiology, Mayo Clinic and Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota. 370 pages, 6" x 9¼", illustrated. $7.50. *New!*

W. B. SAUNDERS COMPANY • West Washington Square, Philadelphia 5

THREE GENERATIONS OF PATIENTS HAVE TAKEN
ANTACID, EFFERVESCENT

Sal Hepatica®

Since 1897, sparkling SAL HEPATICA has given prompt, gentle relief of constipation. Because it is both antacid and effervescent, SAL HEPATICA passes rapidly through the stomach. In the intestine, its osmotic action provides liquid bulk to stimulate peristalsis, hasten evacuation.

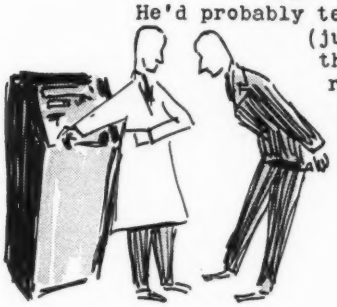
Taken half an hour before the evening meal, pleasant-tasting SAL HEPATICA usually acts before bedtime. Taken before breakfast results may be expected in an hour.

SAL HEPATICA is mild, relieves without griping. Being antacid, it alleviates the gastric hyperacidity which frequently accompanies constipation.

BRISTOL-MYERS CO., 19 West 50 Street, New York 20, N.Y.

If you could visit with a user of the Picker Anatomatic Century x-ray unit you'd soon know why this remarkable "new way in x-ray" machine has come so far so fast.

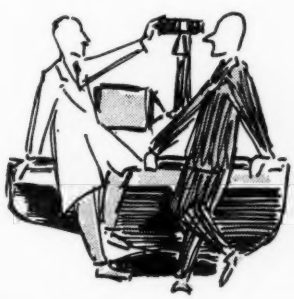
He'd probably tell you first how incredibly easy it is to use (just dial the body part and set its thickness... then press the button). He might sigh with relief at having no charts to consult, no calculations to make (the anatomatic principle does all the tedious "figgerin" for you).



He'd probably show you how good a radiograph he gets every time

He might even touch on the peace-of-mind that comes of having a local Picker office so near, with a trained Picker expert always on call for help and counsel

and there'd be no mistaking the light in his eye when it falls on the handsome big-name unit whose fine appearance adds so much to the impressiveness of his office.



P.S. Somewhere along the line the matter of price would come up ... he'd most likely comment on how little he paid to get so much. Or he might even be among those who rent their x-ray machine (Picker has an attractive rental plan, you know).

P.P.S. Next best thing is to call your local Picker man in and let him tell you about this great new machine (find him in your 'phone book) or write Picker X-Ray Corporation, 25 South Broadway, White Plains, N. Y.

The
JOURNAL
of the AMERICAN
OSTEOPATHIC ASSOCIATION

January 1957 Vol. 56, No. 5

275 Osteopathic Research: Why, what, whither? An examination of its content, direction, and relation to the function of osteopathic medicine.
Irvin M. Korr, Ph.D., Kirksville, Missouri

286 The effect of progressively increased exercise on heart size.
Philip J. Rasch, Ph.D., and Frederick Krieger, B.A., Los Angeles, California

288 Cardiac arrhythmias during surgical anesthesia.
Norman Cassett, A.B., D.O., Philadelphia, Pennsylvania

296 Spinal adaptation to environmental stress: A radiologic evaluation.
Charles D. Ogilvie, D.O., Dallas, Texas

301 Editorials

305 Case Reports
Erythroblastosis fetalis due to the Kell factor.
Norman W. Arends, D.O., Huntington Woods, Michigan
Polycythemia produced by overtransfusion.
A. A. Golden, D.O., Wilmington, Delaware

309 Department of Professional Affairs
Guide for Administrative Procedure. Committee on Ethics and Censorship

313 Department of Public Affairs

314 Current Literature

318 Book Reviews

323 Educational Supplement

325 Osteopathic Education
Lawrence W. Mills, Chicago, Illinois

331 Educational Standards for Osteopathic Colleges

334 A Brief History of Accreditation of Osteopathic Colleges
Lawrence W. Mills, Chicago, Illinois

336 Osteopathic College Expansion

336 Dates of Next First-Year Student Matriculation

337 Registry of Osteopathic Hospitals

Published monthly by the American Osteopathic Association. Printed by Pioneer Publishing Company. **PUBLICATION OFFICE**, 100 S. Kenilworth Ave., Oak Park, Ill. **EDITORIAL AND EXECUTIVE OFFICES**, 212 E. Ohio St., Chicago 11, Ill. Subscription $10 a year; single copies, $1.00. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 31, 1922. Entered at Oak Park, Ill., Post Office as second class matter April 1, 1926, under the Act of March 3, 1879.

ALL CORRESPONDENCE should be addressed to 212 E. Ohio St., Chicago, Ill. **CHANGE OF ADDRESS:** If possible, clip address from mailing envelope of your copy of this magazine and send along with new address (with zone number if any). Allow 5 weeks for change-over.

Copyright, 1957, by American Osteopathic Association.

INFORMATION FOR CONTRIBUTORS

THE JOURNAL OF THE AMERICAN OSTEOPATHIC ASSOCIATION is the official scientific publication of the American Osteopathic Association. Articles are accepted with the understanding that they have not been published or accepted for publication elsewhere.

MANUSCRIPTS

1. Manuscripts should be typed in triplicate, the original and carbon sent to THE JOURNAL, and one carbon kept by the author. All copy, including quotations, footnotes, tables, references, and legends for figures, should be double-spaced, with ample margins.

2. References are required for all material derived from the work of others, whether or not authors' names are mentioned. Reference numbers should be assigned in order of reference in the article. Each reference must include the name of the author and the full title of the article or book. For periodicals, the name, volume number, complete date, and inclusive paging of the article are required. For books, the edition, the name and location of the publisher, and the year of publication are required. Exact page numbers must be given for all direct quotations.

3. The author's degrees and teaching affiliations should be given.

4. The article should end with a comprehensive summary.

ILLUSTRATIONS

1. Photographs should be unmounted, untrimmed, glossy prints.

2. Figures, charts, tables which are to be engraved, and lettering on prints should be in black (India) ink on good quality white paper. Lettering must be large enough to be read when reduced.

3. Original roentgenograms or slides can be used for reproduction, but direct-contact glossy prints from originals are preferable.

4. All illustrations must be numbered and the top indicated. If original roentgenograms or slides are submitted, the front must also be indicated.

5. Good illustrations enhance the value of articles, and contributors are encouraged to submit illustrative material with manuscripts.

6. When illustrations which have appeared elsewhere are submitted, full information should be given about previous publication, whether or not permission has been obtained, and credit to be given.

COPIES OF THE JOURNAL

1. Three copies of THE JOURNAL containing his article will be sent to the author on request.

REPRINTS

1. A price list with information for ordering reprints is sent with galley proofs.

FOR ADDITIONAL INFORMATION, PLEASE WRITE TO THE EDITOR

to promptly stop severe nausea and vomiting...

AMPULS for your bag. For immediate control of drug-, disease- or irradiation-induced vomiting. Dramatic results often obtained in cases unrelieved by other antiemetics. 25 mg. (1 cc.) and 50 mg. (2 cc.) ampuls in boxes of 6.

SUPPOSITORIES. When oral doses cannot be retained and when injections are not practicable—these are the obvious answer. Rapidly absorbed. Two strengths: 100 mg. for adults, and 25 mg. for children.

SYRUP for pediatric use. Often one dose stops the vomiting of gastroenteritis. Each 5 cc. (1 teaspoonful) contains 10 mg.

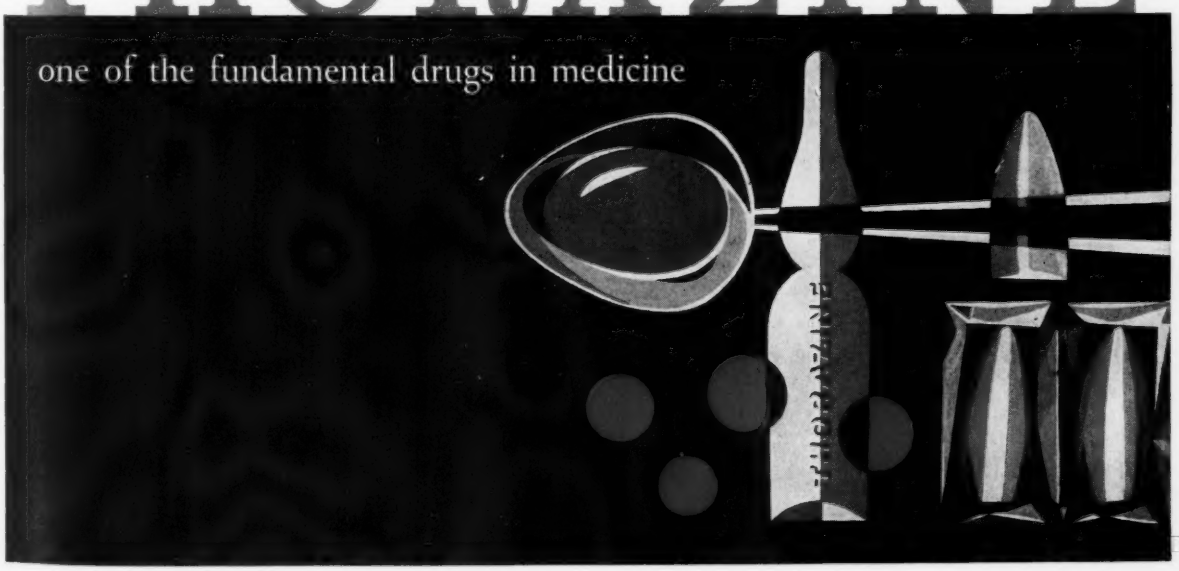
TABLETS when oral dosage is feasible. Available in 10, 25, 50 and 100 mg. tablets.

Smith, Kline & French Laboratories, Philadelphia

*T.M. Reg. U.S. Pat. Off. for chlorpromazine, S.K.F.

THORAZINE*

one of the fundamental drugs in medicine

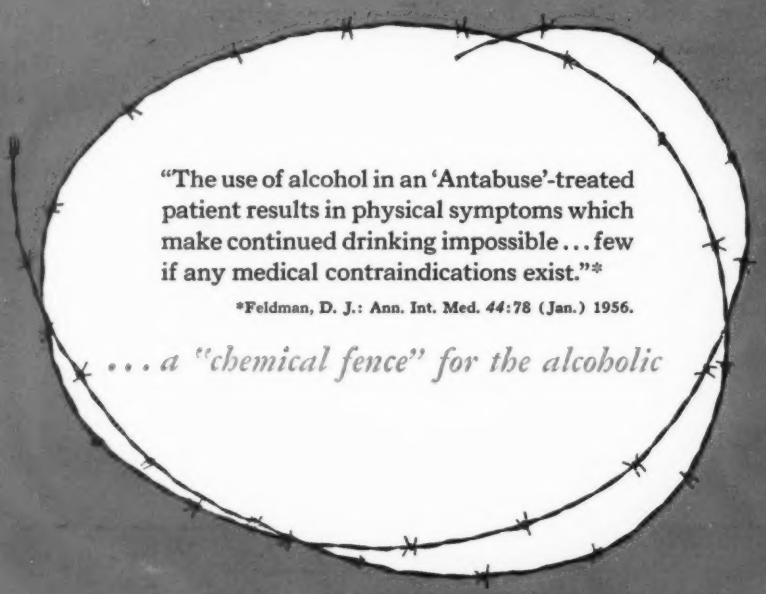


clinically proved in alcoholism

"ANTABUSE"®

brand of DISULFIRAM (tetraethylthiuram disulfide)

Feldman reports:
"... 'Antabuse' therapy constitutes a major advance in treatment."*



"The use of alcohol in an 'Antabuse'-treated patient results in physical symptoms which make continued drinking impossible ... few if any medical contraindications exist."*

*Feldman, D. J.: Ann. Int. Med. *44*:78 (Jan.) 1956.

... a "chemical fence" for the alcoholic

A brochure giving full details of therapy will be sent to physicians upon request.

"ANTABUSE" is supplied in 0.5 Gm. tablets (scored), bottles of 50 and 1,000.

Ayerst Laboratories • New York, N. Y. • Montreal, Canada

5654

invitation to asthma?

not necessarily . . .

Tedral, taken at the first sign of attack, often forestalls severe symptoms.

relief in minutes . . . Tedral brings symptomatic relief in a matter of minutes. Breathing becomes easier as Tedral relaxes smooth muscle, reduces tissue edema, provides mild sedation.

for 4 full hours . . . Tedral maintains more normal respiration for a sustained period—not just a momentary pause in the attack.

Tedral provides:

Theophylline	2 gr.
Ephedrine HCl	3/8 gr.
Phenobarbital	1/8 gr.

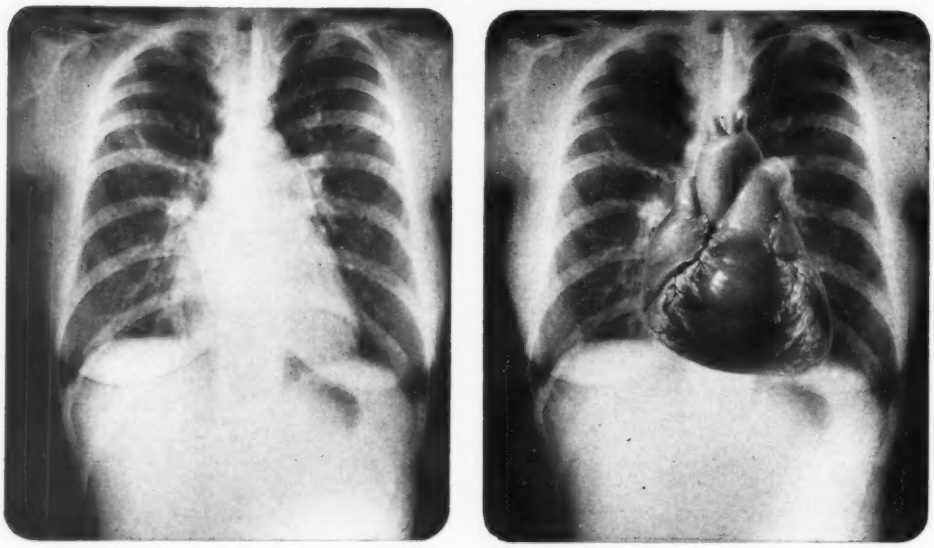
in boxes of 24, 120 and 1000 tablets

Tedral®

WARNER-CHILCOTT

"A GOOD PRESENT DAY ALL-PURPOSE DIGITALIS...GITALIGIN ...A PREPARATION WHICH HAS A WIDER MARGIN OF SAFETY..."*

VISUAL HEART CLINIC—NUMBER ONE OF A SERIES



RHEUMATIC HEART DISEASE • MITRAL STENOSIS AND INSUFFICIENCY

ROENTGEN CONFIGURATION—Postero-anterior examination—moderate heart enlargement—right ventricular enlargement—prominence of pulmonary artery segment.

Taken from White Laboratories' Technical Exhibit, American Medical Association 105th Annual Meeting, Chicago, June 11-15, 1956.

Every year since 1950 when Batterman, et al., published the results of their study of 230 cardiac patients, clinical evidence has repeatedly confirmed the therapeutic advantages of GITALIGIN.

For initial digitalization and maintenance, GITALIGIN has proved to be "the digitalis of choice" for these significant reasons:

(1) Widest safety margin of any currently available digitalis glycoside (average therapeutic dose only 1/3 the toxic dose; in contrast, therapeutic doses of other preparations are approximately 2/3 toxic dose)
(2) Uniform clinical potency
(3) Moderate rate of dissipation
(4) Short latent period

Patients now being maintained with other cardiotonics can be easily switched to GITALIGIN: 0.5 mg. of GITALIGIN is approximately equivalent to 0.1 Gm. digitalis leaf, 0.1 mg. digitoxin, 0.5 mg. digoxin.

White's | GITALIGIN®

(WHITE'S BRAND OF AMORPHOUS GITALIN)

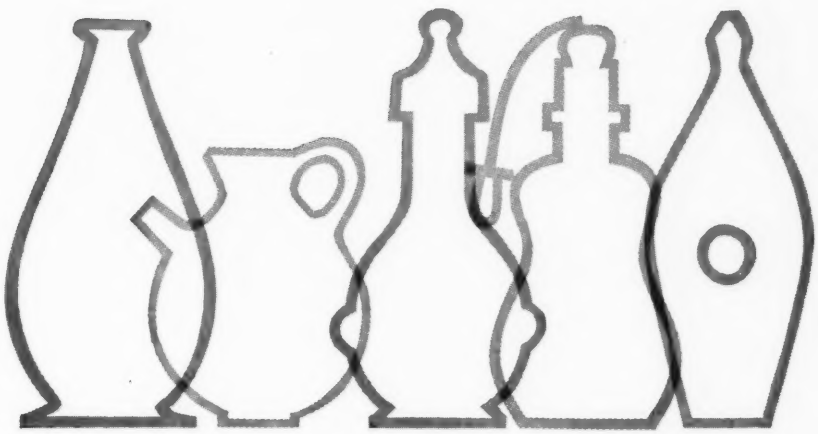
TABLETS—BOTTLES OF 30, 100, AND 1000 DROPS—30 CC. BOTTLES WITH DROPPER CALIBRATED FOR 0.05, 0.1, 0.2, 0.3, 0.4 AND 0.5 MG.

INJECTION—5 CC. AMPULS CONTAINING 2.5 MG. (0.5 MG. PER CC.) OF GITALIGIN. PACKAGES OF 3 AND 12 AMPULS.

White Laboratories, Inc. Kenilworth, New Jersey

*EHRLICH, J.C.: ARIZONA MED 12:239 (JUNE) 1955. BIBLIOGRAPHY FURNISHED ON REQUEST

which present reproductions of Pediatric Antiques from the Mead Johnson Collection.



and information on

THE MEAD JOHNSON FORMULA PRODUCTS FAMILY—A FAMILY ESPECIALLY DESIGNED FOR YOUR CONVENIENCE AND SERVICE

MEAD JOHNSON

SYMBOL OF SERVICE IN MEDICINE

for the 300 B.C. infant...

The spout of this Grecian feeding bottle, from the Mead Johnson Collection of Pediatric Antiques, served as a nipple for the infant, a most convenient device for the mother.

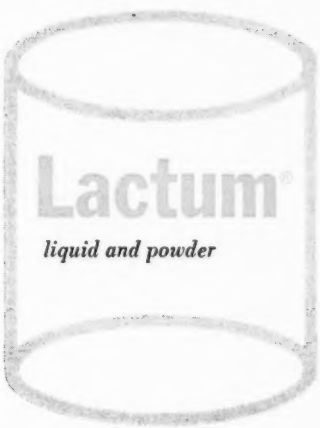
today, for routine infant feeding...

When you prescribe Lactum—milk and Dextri-Maltose formula—you provide nutritional safeguards essential to sturdy growth and development.

According to Frost and Jackson, "infants fed this formula...have mean height and weight curves slightly above normal, and a normal or superior picture of general development."

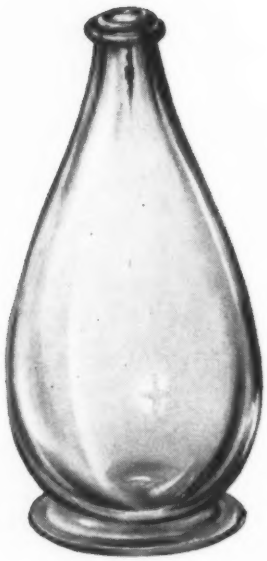
(Frost, L. H., and Jackson, R. L.: J. Pediat. 39:585-592, 1951.)

you have the convenience of ready-to-use



EEDING ME CTUM® OLAC® DEXTRI-MALTOSE® SOBEE® NUTRAMIGEN® PROBANA®

MEAD JOHNSON
SYMBOL OF SERVICE IN MEDICINE



for the 1840 infant...

Early American glass nursing bottle from the Mead Johnson Collection of Pediatric Antiques.

today, for routine infant feeding...

you have the convenience of ready-to-use **Olac®**

liquid and powder

Olac is a balanced formula made from non-fat milk, refined vegetable oil and Dextri-Maltose. It is generous in protein and specially processed for digestibility.

Mothers appreciate the freedom from offensive stool odor and regurgitation after-smell—and the low incidence of feeding problems.

THE MEAD JOHNSON FORMULA PRODUCTS FAMILY FOR EVERY INFANT FEEDING NE

for the 1860 infant...

Whisky flask adapted for infant feeding, from the Mead Johnson Collection of Pediatric Antiques.

today, you can meet professional standards

for milk modification with **Dextri-Maltose®**

Dextri-Maltose, carbohydrate designed specifically for infant formulas, is manufactured with meticulous care to meet the highest standards of nutritional and pharmaceutical excellence. It offers benefits of spaced carbohydrate absorption, nonsweetness, bacteriologic safety and convenience.

EEDING NE LACTUM® OLAC® DEXTRI-MALTOSE® SOBEE® NUTRAMIGEN® PROBANA® MEAD JOHNSON

SYMBOL OF SERVICE IN MEDICINE

for the 1780 infant...

This pewter feeding bottle, from the Mead Johnson Collection of Pediatric Antiques, was not only shapely, but convenient to use. This bottle was made in England, but bottles of this type were used also in France and Holland.

today, for milk-sensitive patients...

A soya formula, not just a "soybean milk," Sobee Liquid provides well-tolerated, balanced feedings. No extra carbohydrate need be added. "Thermo-flash sterilization" gives pleasant bland taste and light color. Babies take the formula well. Both skin and gastrointestinal symptoms caused by milk allergy are usually relieved promptly. Stools are satisfactory...and diaper staining no problem.

Note: For patients allergic to soybean or *any* intact protein, Nutramigen provides a balanced hypoallergenic formula containing protein in "predigested" (hydrolyzed) form.

you have the convenience of ready-to-use

LACTUM® OLAC® DEXTRI-MALTOSE® SOBEE® NUTRAMIGEN® PROBANA®

MEAD JOHNSON
SYMBOL OF SERVICE IN MEDICINE

for the 1820 infant . . .

Spode transfer-printed feeding bottle from the Mead Johnson Collection of Pediatric Antiques.

today, in chronic digestive disorders . . .

you have the convenience of ready-to-use **Probana®**

Probana is a therapeutic formula made from powdered protein milk, hydrolyzed casein, banana powder and dextrose. It is high in easily utilized protein, low in fat, and provides carbohydrate largely as simple sugars. Provides well-tolerated feedings in celiac disorders and pancreatic fibrosis ...equally valuable in other conditions involving chronic diarrhea, steatorrhea or digestive disturbance.

Infant feeding experience for the past 50 years provides the background for the products in the Mead Johnson Formula Products Family. Today, you can meet your feeding needs for both well and sick babies with convenient Mead Johnson formulas. Each product provides an authoritative formulation, and is manufactured with meticulous care to meet the highest standards of nutritional and pharmaceutical excellence.

THE MEAD JOHNSON FORMULA PRODUCTS FAMILY INCLUDES

for routine infant feeding

Lactum
liquid • powder
milk and Dextri-Maltose formula

non-fat milk, refined vegetable oil and Dextri-Maltose formula

Olac
liquid • powder

Dextri-Maltose
carbohydrate modifier

for allergic infants

balanced soya formula

Sobee
liquid

Nutramigen
hydrolyzed casein, Dextri-Maltose, arrowroot starch and corn oil formula

for chronic digestive disorders

Probana
formula of protein milk, hydrolyzed casein, banana powder and dextrose

LACTUM® OLAC® DEXTRI-MALTOSE® SOBEE® NUTRAMIGEN® PROBANA®

MEAD JOHNSON
SYMBOL OF SERVICE IN MEDICINE

13357

TODAY'S COLLEGE GRADUATES HAVE BIGGER FAMILIES—PLANNED BIG

EVEN COLLEGE GRADUATES, traditionally the low-birthrate group, are having big families today. Planning them bigger. A survey just completed among 29,494 graduates of 176 colleges shows that the men of the class of '45 have families averaging 70% larger than those of the class of '36 in the ten years after graduation.[1]

Want big, but spaced, families — When these wives come to you for contraceptive advice so that they can space their large families, they want to be sure that the recommended method *really* gives them protection. You can give them this assurance with diaphragm and jelly—*the preferred technique for women of high parity*. These patients may not be as well protected by use of jelly alone, a method that seems better suited to low-parity women. In urban population groups using the diaphragm-jelly method, unplanned pregnancy occurred only "once in ten to 15 years."[2]

Security plus comfort — RAMSES® Diaphragm and Jelly assure comfort as well as peace of mind for your patient. The cushioned, flexible rim of the RAMSES Diaphragm permits complete freedom of movement, causes no irritation. RAMSES Jelly,* a "10-hour jelly," quickly immobilizes sperm and occludes for a *full ten hours*.

When patients learn that for more than 30 years physicians have relied on RAMSES Diaphragms and Jelly to help plan families — big families — they will feel confident of receiving sound advice. RAMSES "TUK-A-WAY"® Kit #701 (diaphragm, introducer and jelly in a neat zippered bag), RAMSES Diaphragms 50-95 millimeters in size, RAMSES Jelly in 3 and 5 oz. tubes.

1. College Study Report: Population Bulletin *11*:45 (June) 1955.
2. Tietze, C., in Dickinson, R. L.: Techniques of Conception Control, ed. 3, Baltimore, Williams & Wilkins Co., 1950, pp. 55-57.

RAMSES and "TUK-A-WAY" are registered trade-marks of Julius Schmid, Inc.

*Active agent, dodecaethyleneglycol monolaurate 5%, in a base of long-lasting barrier effectiveness.

JULIUS SCHMID, INC.
423 West 55th Street, New York 19, N. Y.

Life without Frenzy

He used to fuss and fume when traffic slowed him down. Now he relaxes—his pace of living has been "calmed down"—since his doctor prescribed

Butiserpine®

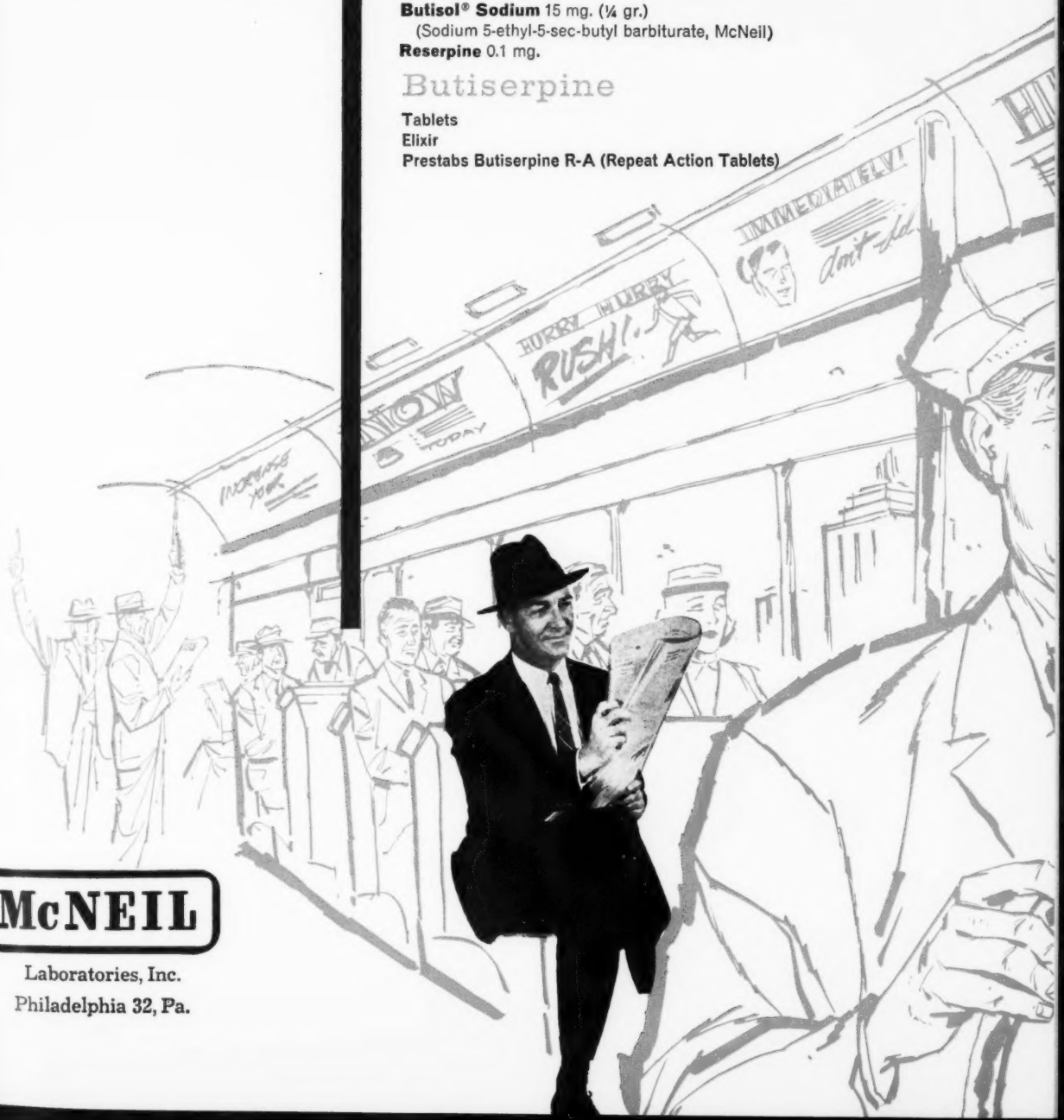
That's the tranquilizing-sedative-hypotensive effect BUTISERPINE has on tense, highstrung patients. Its *Butisol* component quickly induces a more reasonable, tranquil attitude. This gives the *reserpine* component a chance to build up to its maintenance tranquilizing effect.

Now you can prescribe Butiserpine also in its delightful Elixir form. Each tablet or teaspoonful of elixir contains:

Butisol® Sodium 15 mg. (¼ gr.)
(Sodium 5-ethyl-5-sec-butyl barbiturate, McNeil)
Reserpine 0.1 mg.

Butiserpine

Tablets
Elixir
Prestabs Butiserpine R-A (Repeat Action Tablets)



McNEIL

Laboratories, Inc.
Philadelphia 32, Pa.

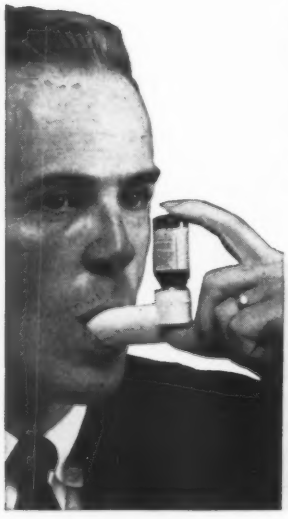
In Angina Pectoris

when every moment counts

Relief in 10 to 30 Seconds

Medihaler-Nitro™

Medihaler®... the Unique Measured-Dose Inhalation Principle



- More rapid relief than from sublingual nitroglycerin because pulmonary portal of entry affords most direct route . . . only the single-cell barrier of alveolar lining to cross.
- Each measured dose of Medihaler-Nitro delivers 0.25 mg. of octyl nitrite, equivalent in vasodilating action to 1/100 gr. nitroglycerin.
- In contrast to amyl nitrite, Medihaler-Nitro has no irritating odor . . . is virtually free from side actions . . . and vasodilating effect lasts longer.
- Medication and Adapter fit into neat plastic case, convenient for pocket or purse.
- Economical . . . each 10 cc. bottle delivers 200 metered doses . . . no deterioration with age.

Note: First prescription should include medication *and* Medihaler Oral Adapter.

Pentoxylon®

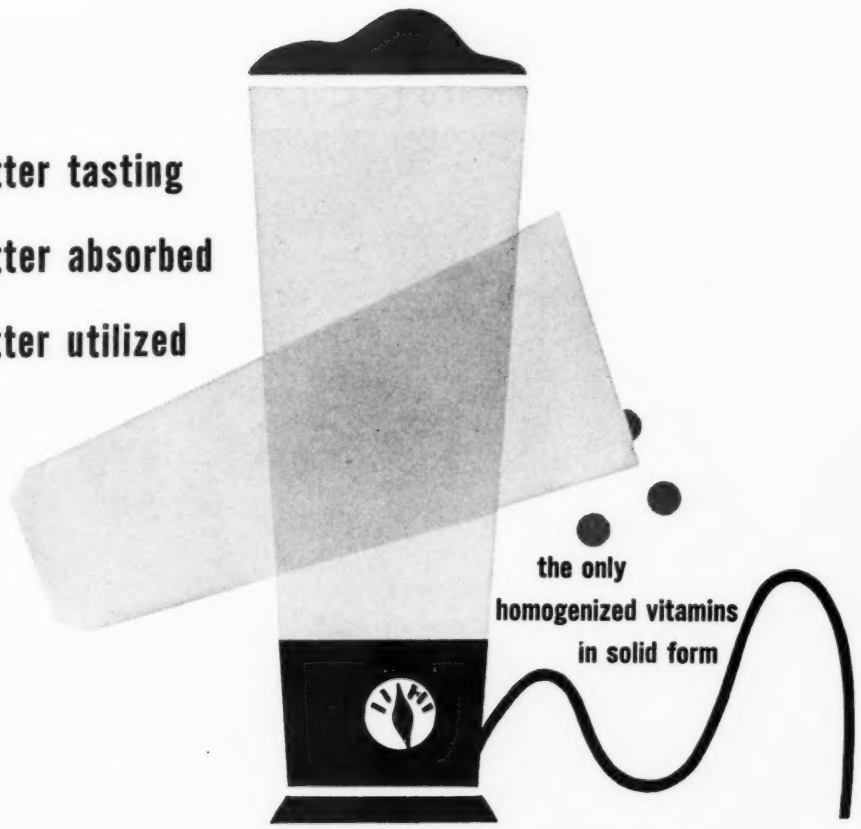
Reduces incidence and severity of anginal attacks. Each long-acting tablet contains pentaerythritol tetranitrate (PETN) 10 mg. and Rauwiloid® (alseroxylon) 1 mg. Patients on Pentoxylon suffer fewer anginal attacks.

Riker
LOS ANGELES

better tasting

better absorbed

better utilized



HOMAGENETS®*

Homagenets provide multivitamins in the same way as do the most nutritious foods. By a unique process, the vitamins are homogenized, then fused into a solid, highly palatable form. Compare the taste of Homagenets with other vitamin preparations.

Homogenization presents both oil and water soluble vitamins in microscopic particles. This permits greater dispersion of the vitamins—thus better absorption and utilization. And the flavorful base assures patient acceptance.

*U.S. Pat. 2676136. Other Pat. Pending

Advantages—

Better absorption, better utilization

Excess vitamin dosage unnecessary

Pleasant, candy-like flavor

No regurgitation, no "fishy burp"

May be chewed, swallowed or dissolved in the mouth

Three formulas:

Prenatal Pediatric Therapeutic

Send for samples of Homagenets. Taste them, and compare.

The S. E. MASSENGILL Company

BRISTOL, TENNESSEE • NEW YORK • KANSAS CITY • SAN FRANCISCO

ANNOUNCING

CATHO

more effective
in clinically
important infections
than any other
antibiotic

FOR MOST INFECTIONS

CILLIN

NEW

(NOVOBIOCIN-PENICILLIN G, MERCK)

THE ANTIBIOTIC PRODUCT MOST LIKELY TO BE EFFECTIVE

COMPARE THESE ADVANTAGES:

1. Proved effectiveness in the largest number of clinically important infections including those caused by antibiotic-resistant *staphylococci* and proteus.
2. Therapeutic, *bactericidal* blood levels are promptly achieved.
3. Exceptionally well tolerated; patient sensitivity reactions are rare at recommended dosage.
4. No yeast or fungal super-infections nor any antibiotic-induced enteritis, vaginitis or proctitis have been reported following CATHOCILLIN.
5. No problems of cross-resistance have been encountered with CATHOCILLIN.
6. The normal intestinal flora is not disturbed by CATHOCILLIN.

DOSAGE: *for adults—two capsules q.i.d.; for children under 100 lbs.—dosage in proportion to weight (e.g. one capsule q.i.d. for a child weighing 50 lbs.).*

CONSIDER CATHOCILLIN FIRST

—for these clinically important infections: tonsillitis; pharyngitis; pneumonia; otitis media; cervical lymphadenitis; streptococcal sore throat; infected tooth sockets; Vincent's infection; acne and superficial skin infections; impetigo; boils, furuncles and carbuncles; lung abscess; bronchitis; mastitis; osteomyelitis; wound infections; postoperative wound infections and infected lacerations; staphylococcal enteritis, staphylococcal diarrhea of the newborn; peritonitis (caused by susceptible organisms); pelvic inflammatory disease; gonorrhea; gonococcal arthritis; urethritis; scarlet fever; erysipelas.

SUPPLIED: *Blue and white capsules of* 'CATHOCILLIN' *—each containing 125 mg. of* 'CATHOMYCIN' *(as Sodium Novobiocin, Merck) and 75 mg. (125,000 units) Potassium Penicillin G; bottles of 16.*

In one prescription the one antibiotic product most likely to be effective

MSD MERCK SHARP & DOHME

DIVISION OF MERCK & CO., INC., PHILADELPHIA 1, PA.

Erythromycin in Treating Pneumonia

A 27-year-old man, a chronic alcoholic, was admitted with a history of an alcoholic spree followed by a cough, greenish sputum and chills and fever.

Physical examination showed a temperature of 104 F. and indicated pneumonia in the right lower lobe. This was confirmed by X-ray. The sputum revealed gram-positive diplococci and blood culture subsequently grew Type VII pneumococci.

The patient was treated with erythromycin, 300 mg. every six hours per os. His temperature dropped to normal by 48 hours and X-ray of the chest revealed considerable clearing by the fourth hospital day. After 10 days hospitalization, the patient was fit for discharge.[1]

First Antibiotics Symposium, we reported the successful treatment with thromycin of *H. influenzae* pneumonia and bacteremia. A second patient with *H. influenzae* pneumonia and bacteremia had a clinical course almost identical to the one previously reported, with cure obtained by treatment with 500 mg. of erythromycin per os every four hours for 14 days.

Of these 132 patients with bacterial pneumonia, 127 (96%) had a good clinical result. One patient with lobar pneumonia had a good initial delayed

"Highly Effective in Pneumonia"

In one investigation, 75 adult patients with bacterial pneumonia were treated with erythromycin. In his summary, the clinician reported: "It is concluded that erythromycin is highly effective in the treatment of pneumonia due to gram-positive bacteria."[2]

This, of course, is only one of many reports showing the effectiveness of ERYTHROCIN against coccic infections. You'll get the same good results (nearly 100% in common, bacterial respiratory infections) when you prescribe ERYTHROCIN. Abbott

filmtab®

Erythrocin®

(Erythromycin, Abbott)

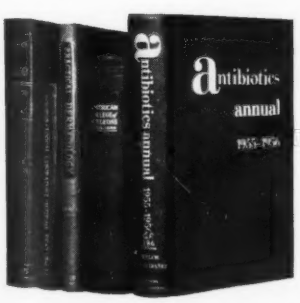
STEARATE

"No Serious Side Effects Occurred"

After a study of 171 patients treated with erythromycin, the investigator wrote: "No serious side effects occurred with prolonged therapy or with doses up to 8 Gm. per day in the severe infections."[1]

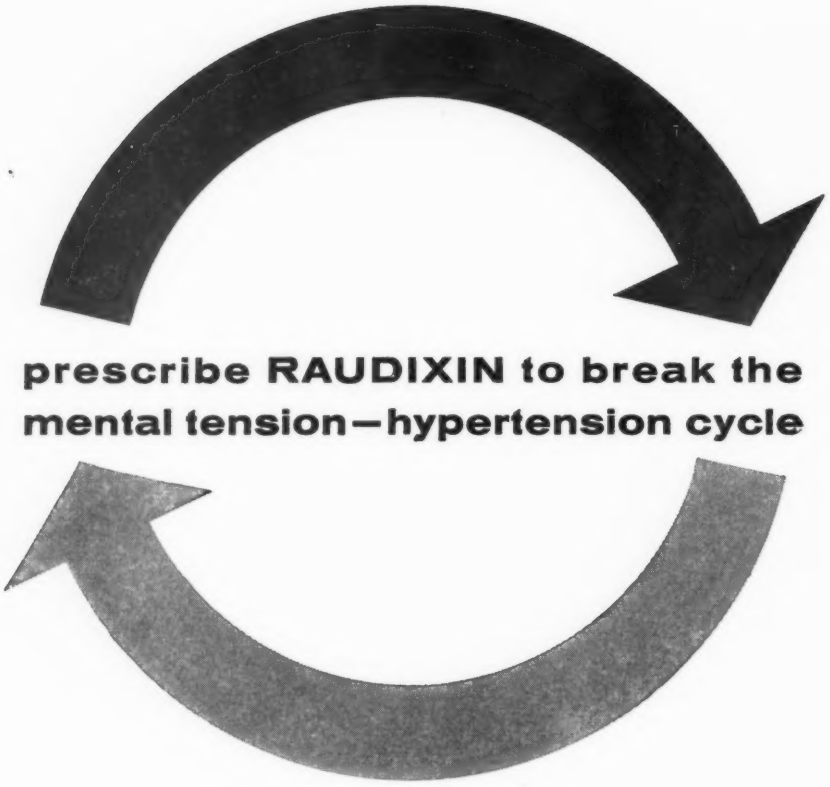
Actually, ERYTHROCIN stands on a remarkable record of safety. After four years, there's not a single report of a severe or fatal reaction attributable to erythromycin. In addition, you'll find allergic manifestations rarely occur. *Filmtab* ERYTHROCIN Stearate (100 and 250 mg.), in bottles of 25 and 100. Abbott

® Filmtab—Film-Sealed tablets, Abbott; pat. applied for.



1. Romansky, M.J., et al., Antibiotics Annual 1955-1956, p. 48,
2. Waddington, W. S., Maple, F. C., and Kirby, W. M. M., A.M.A. Archives of Internal Medicine, 1954, p. 556.

701051



prescribe RAUDIXIN to break the mental tension—hypertension cycle

*Raudixin reduces mental tension

Tranquilizing Raudixin reduces the mental tension which plays a significant role in hypertension . . . reduces mental tension as yet unrelated to physical symptoms.

*Raudixin reduces hypertension

Blood pressure lowering effect is gradual, sustained in hypertensives . . . little or no hypotensive effect is produced in normotensives.

*Single daily dosage

Discourages promiscuous over-use by patients . . . not habit-forming.

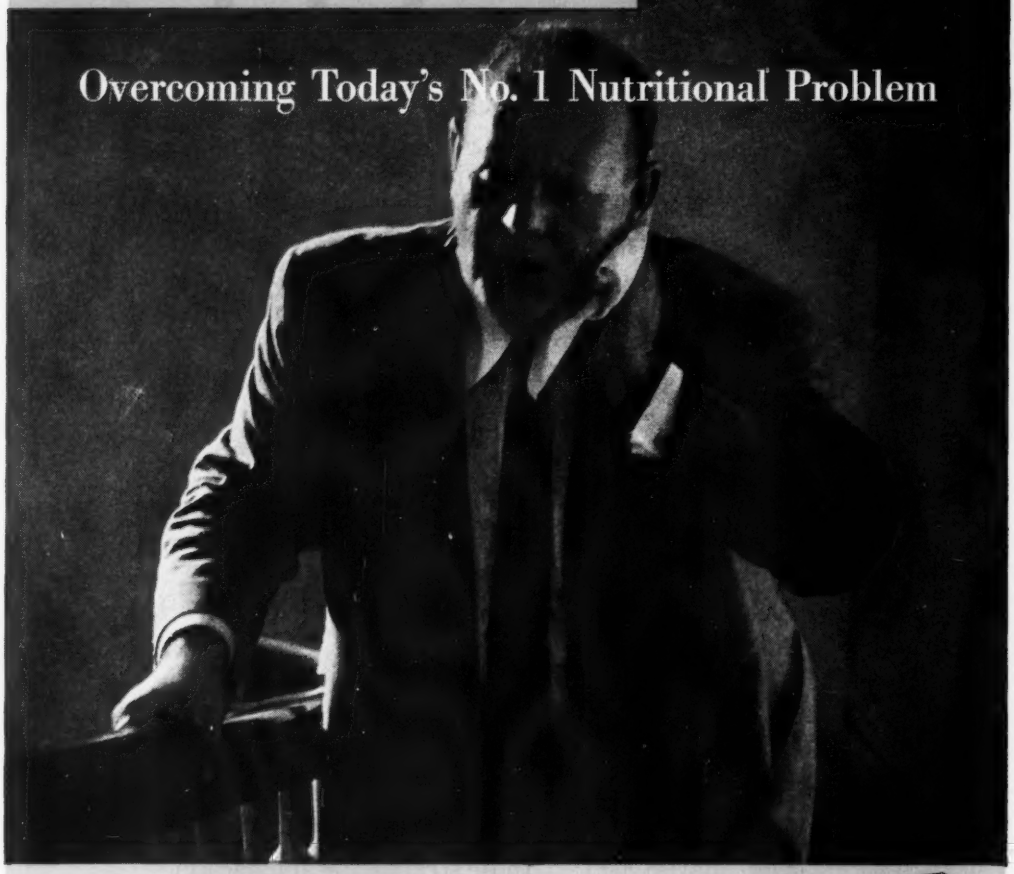
RAUDIXIN

Squibb Whole Root Rauwolfia Serpentina

SQUIBB *Squibb Quality—the Priceless Ingredient*

*RAUDIXIN® IS A SQUIBB TRADEMARK

KNOX PROTEIN PREVIEWS



Knox "Choice of Foods" Diet Can Help Your CARDIAC Patients Lose Weight Successfully

1. Color-coded diets of 1200, 1600 and 1800 calories are based on nutritionally-sound Food Exchanges.[1]

2. Easy-to-use Food Exchanges (referred to in the Knox booklet as Choices) eliminate calorie counting by patient.

3. Diets promote accurate adjustment of caloric levels to the special needs of the patient yet allow each individual considerable latitude in the choice of foods.

4. More than six dozen appetizing, low-calorie recipes are presented on the last 14 pages of each diet booklet.

1. The Food Exchange Lists referred to are based on material in "Meal Planning with Exchange Lists" prepared by Committees of the American Diabetes Association, Inc., and The American Dietetic Association in cooperation with the Chronic Disease Program, Public Health Service, Department of Health, Education and Welfare.

Chas. B. Knox Gelatine Co., Inc.
Professional Service Dept. JO-25
Johnstown, N. Y.

Please send me ..... dozen copies of the new illustrated Knox Reducing booklet based on Food Exchanges.

Your Name and Address

for added certainty

in antibiotic therapy...

multi-spectrum†
synergistically
strengthened

Sigma

†the antimicrobial spectrum of tetracycline extended and potentiated to include even those strains of staphylococci and other pathogens resistant to previously employed antibiotic therapy; and to provide

1. a new maximum in therapeutic efficacy

2. a new maximum in protection against resistance

3. a new maximum in safety and toleration

Capsules: 250 mg. (oleandomycin 83 mg., tetracycline 167 mg.)

Pfizer *World leader in antibiotic development and production*

*Trademark

plus a new maximum in palatability... *now available with new mint-flavored*

amycin*

OLEANDOMYCIN TETRACYCLINE

for ORAL SUSPENSION

A savory mint flavor that adds the further certainty of acceptability to antibiotic therapy, particularly for that 90% of the patient population treated in the home or office where sensitivity testing may not be feasible, and where pleasant flavor can make the difference between prescription adherence and laxity.

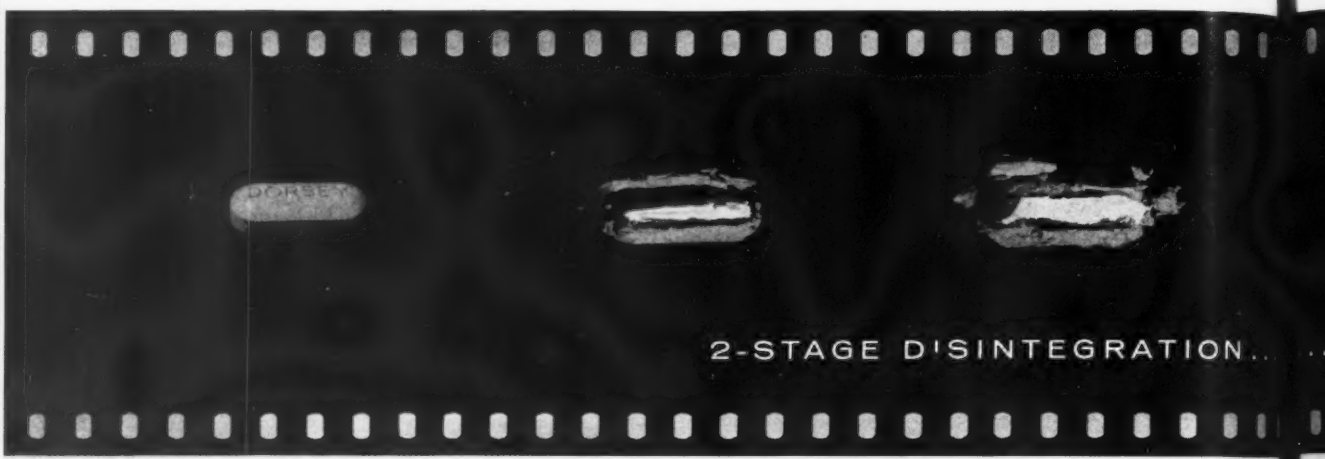
Sigmamycin for Oral Suspension

is available in 2 oz. bottles containing 1.5 Gm. of Sigmamycin (oleandomycin 500 mg., tetracycline 1 Gm.). When reconstituted each 5 cc. teaspoonful contains 125 mg. of Sigmamycin (42 mg. of oleandomycin as the phosphate salt with tetracycline amphoteric equivalent to 83 mg. of tetracycline hydrochloride).

PFIZER LABORATORIES, Brooklyn 6, N.Y.
Division, Chas. Pfizer & Co., Inc.

New...improved salicylate therapy

in a TANDEM RELEASE tablet



The outer layer of Buffered Pabirin Tablets quickly releases aluminum hydroxide for buffering action. PABA to potentiate acetylsalicylic acid and therapeutic doses of ascorbic acid to offset depletion are also in the outer layer.

The inner core of Buffered Pabirin Tablets containing acetylsalicylic acid alone begins to expand after the buffering action has started.

Arthritic patients—the very patients who need salicylate therapy most—are also the ones least able to tolerate salicylates over prolonged periods without gastric distress. This problem is now solved by the new Buffered Pabirin Products. The protective antacid (aluminum hydroxide) buffers against gastric irritation. PABA and the antacid potentiate acetylsalicylic acid and rapidly create high, sustained blood levels with low salicylate dosage...higher than with PABA or buffers alone. Studies show that high salicylate plasma levels promote an increase in production of adrenal cortical hormones.

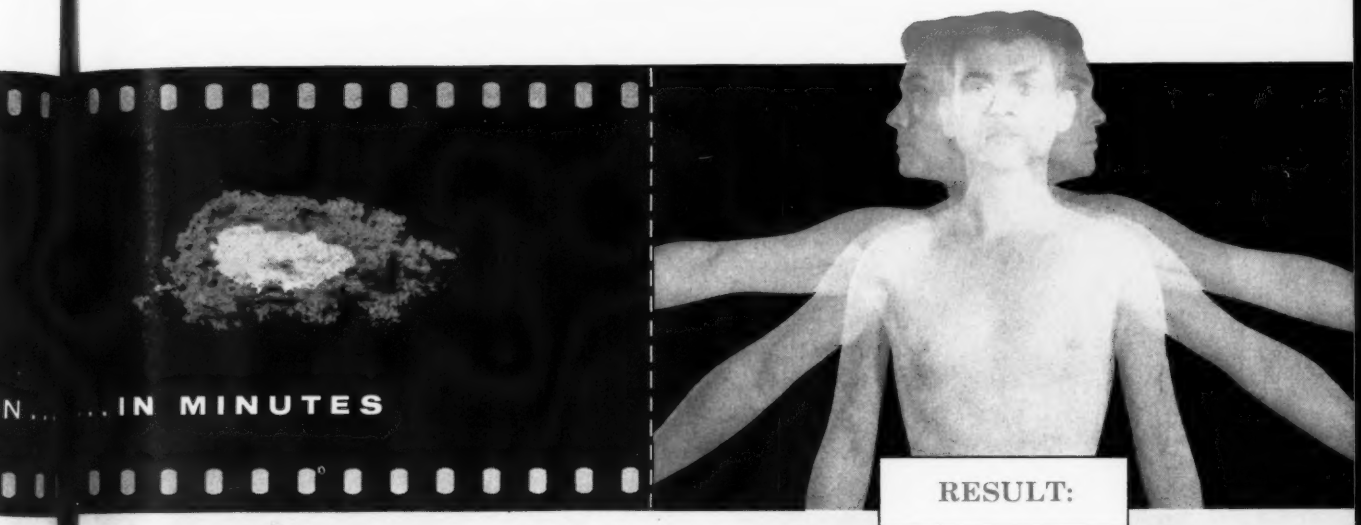
For resistant rheumatics, Buffered Pabirin AC Tablets provide the added benefits of hydrocortisone. The use of hydrocortisone with acetylsalicylic acid reduces corticoid dosage to minimize the danger of adrenal atrophy. And PABA retards breakdown of hydrocortisone by the liver thereby prolonging its effect.

Buffered Pabirin and Buffered Pabirin AC Tablets are both sodium and potassium free.

SMITH-DORSEY • Lincoln, Nebraska • a division of The Wander Company

☆ buffered for superior gastric tolerance

☆ buffered for faster pain relief



The inner core then disintegrates rapidly and permits fast absorption of the acetylsalicylic acid.

Buffered Pabirin AC Tablets release, in addition, hydrocortisone from the core.

- **increased range of motion**
- **faster pain relief**
- **superior gastric tolerance**

for most rheumatoid arthritics

Buffered Pabirin® TABLETS

300 mg.	Acetylsalicylic acid (5 gr.)
300 mg.	Para-aminobenzoic acid (5 gr.)
50 mg.	Ascorbic acid
100 mg.	Dried aluminum hydroxide gel

Dosage: Two or three tablets 3 or 4 times daily. In rheumatic fever three to five tablets 4 or 5 times daily.

for resistant rheumatics

Buffered Pabirin® AC TABLETS

2.5 mg.	Hydrocortisone
300 mg.	Acetylsalicylic acid (5 gr.)
300 mg.	Para-aminobenzoic acid (5 gr.)
50 mg.	Ascorbic acid
100 mg.	Dried aluminum hydroxide gel

Dosage: Initially, one or two tablets 4 times daily, after meals and on retiring. Reduction of dosage should be gradual; never stopped abruptly.

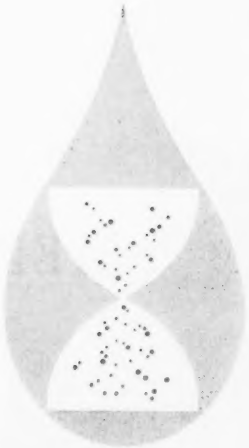
new "a pharmaceutical first"

Conventional Sulfa Suspension X50

'SUL-SPANSION' X50

The spheres shown here are but a few of the many thousands of micropellets in each spoonful of 'Sul-Spansion' liquid.

a well-tolerated broad-spectrum antibacterial
in a new and unique sustained release

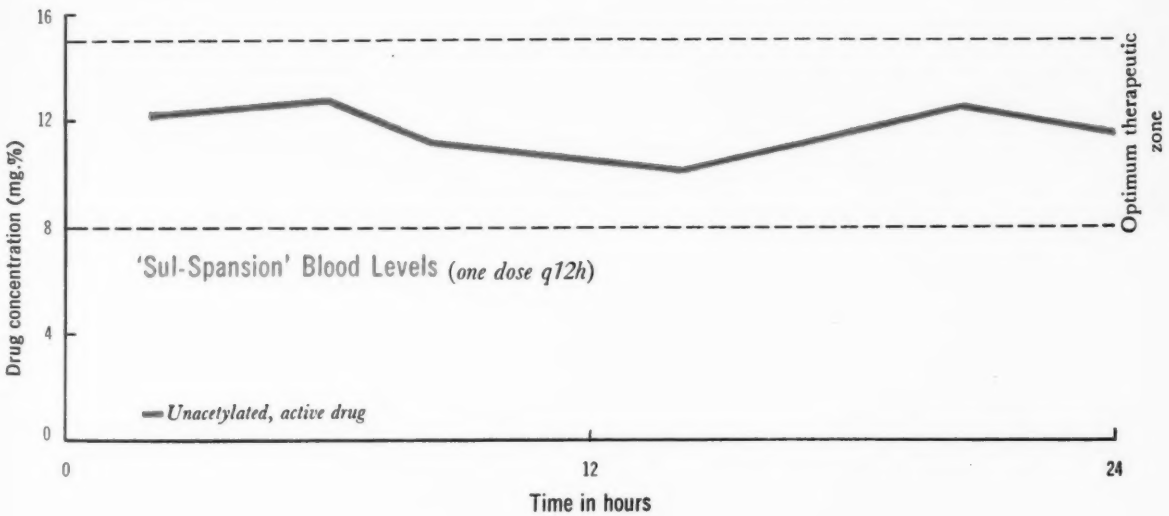


liquid form

Sul-Spansion*

sulfaethylthiadiazole, S.K.F.

(sulfa **Spansule*** suspension)
sustained release



maintains the optimum therapeutic blood levels (8-15 mg.%) uninterruptedly throughout the day and night with a single oral dose q12h

made only by Smith, Kline & French Laboratories, Philadelphia

first in sustained release oral medication

**Trademark*

in

treatment of

MENSTRUAL IRREGULARITIES

let Duosterone®

anhydrohydroxyprogesterone 10.00 mg.
primed by ethinyl estradiol 0.01 mg. } per tablet

"do as the ovaries do..."

A PHYSIOLOGIC REGULATOR: For *Simplified, Oral Treatment* of *Secondary Amenorrhea:* infrequent periods, subnormal flow, *Dysfunctional Uterine Bleeding:* menorrhagia, relapse after curettage, irregular or too frequent periods, prolonged or profuse menses.

OTHER INDICATIONS: Habitual abortion, functional sterility and dysmenorrhea have responded to DUOSTERONE therapy.

ACTION: DUOSTERONE simulates the normal ovarian endocrine pattern of the secretory phase of the menstrual cycle. A normal cycle may be set off by DUOSTERONE, much as touching the pendulum starts a wound clock. Normal menstrual function is *safely* and conveniently restored with essential, two-hormone action provided by DUOSTERONE: (1) Administration of needed progesterone, and (2) Estrogen priming, which is indispensable to adequate progesterone activity.

DUOSTERONE may initiate an endocrine chain-reaction resulting in spontaneous ovulatory cycles according to the concept of Holmstrom.*

*Amer. J. Obst. & Gynec., *68*:1321, 1954

now! *write for:*

Medication Time Calendar... Clinical Supplies

SUPPLIED: DUOSTERONE tablets in bottles of 25 and 100. On prescription only.

ROUSSEL CORPORATION • 155 EAST 44TH ST., NEW YORK 17, N.Y.

Romilar 'Roche' relieves cough—

...specifically,
by direct suppression
of the cough reflex.
But unlike narcotics,
Romilar does not cause
central depression,
drowsiness, constipation,
or other side effects.
Available as syrup,
tablets, and expectorant
(c NH_4Cl).

Romilar® HBr – brand of dextromethorphan HBr

in a single tablet—

pain relief

plus

antibacterial action

AZO GANTRISIN

In urinary tract infections, Azo Gantrisin usually provides effective antibacterial control (local and systemic), together with prompt relief of associated pain and discomfort . . . by combining well-tolerated Gantrisin with a clinically proved urinary analgesic.

ROCHE

Each Azo Gantrisin tablet contains 0.5 Gm Gantrisin 'Roche' plus 50 mg phenylazo-diamino-pyridine HCl.

Gantrisin® - brand of sulfisoxazole

DORBANE

the leading ethical laxative

+ Dioctyl Sodium Sulfosuccinate =

unique, new

DORBANTYL*

unique, new DORBANTYL combines —in proportions proved optimal by clinical trial[1]—

Dioctyl Sodium Sulfosuccinate (50 mg.) —the pharmacologically inert wetting agent that softens and swells hard fecal masses to help form a normal, easily-passed stool,[1,2,3] and

DORBANE (25 mg.)—the crystalline-pure peristaltic stimulant that gently and selectively prods the lower bowel into producing a natural, easy movement.[4]

unique, new DORBANTYL has been clinically proved both safe and effective "...a superior evacuant which retains the advantages of both component drugs without the disadvantages of either used alone."[1]

indications: DORBANTYL is indicated in acute and chronic constipation, whether organic or functional.

dosage: Adults, 2 capsules at bedtime; repeat if needed to cause bowel movement. If necessary, dosage may be increased or decreased to meet individual requirements. Children, 3 to 12 years, 1 or 2 capsules taken as above.

supplied: Bottles of 30 capsules and 250 capsules.

references: (1) Marks, M. M.: In press. (2) Antos, R. J.: Southwestern Med. *37*:236, 1956. (3) Wilson, J. L., and Dickinson, D. G.: J.A.M.A. *158*:261 (May 28) 1955. (4) Marks, M. M.: Am. J. Digest. Dis. *20*:240, 1953.

in occasional constipation or for more rapid response prescribe

DORBANE® **peristaltic stimulant**
selective, persuasive, crystalline-pure
Scored tablets (75 mg.) and
Orange-flavored Suspension (37.5 mg. per 5-cc. tsp.)

DORBANE IS THE REGISTERED TRADEMARK OF SCHENLEY LABORATORIES, INC., FOR ITS BRAND OF 1,8-DIHYDROXYANTHRAQUINONE.
*DORBANTYL IS THE TRADEMARK OF SCHENLEY LABORATORIES, INC., FOR ITS BRAND OF DANTHRON WITH DIOCTYL SODIUM SULFOSUCCINATE. 40156

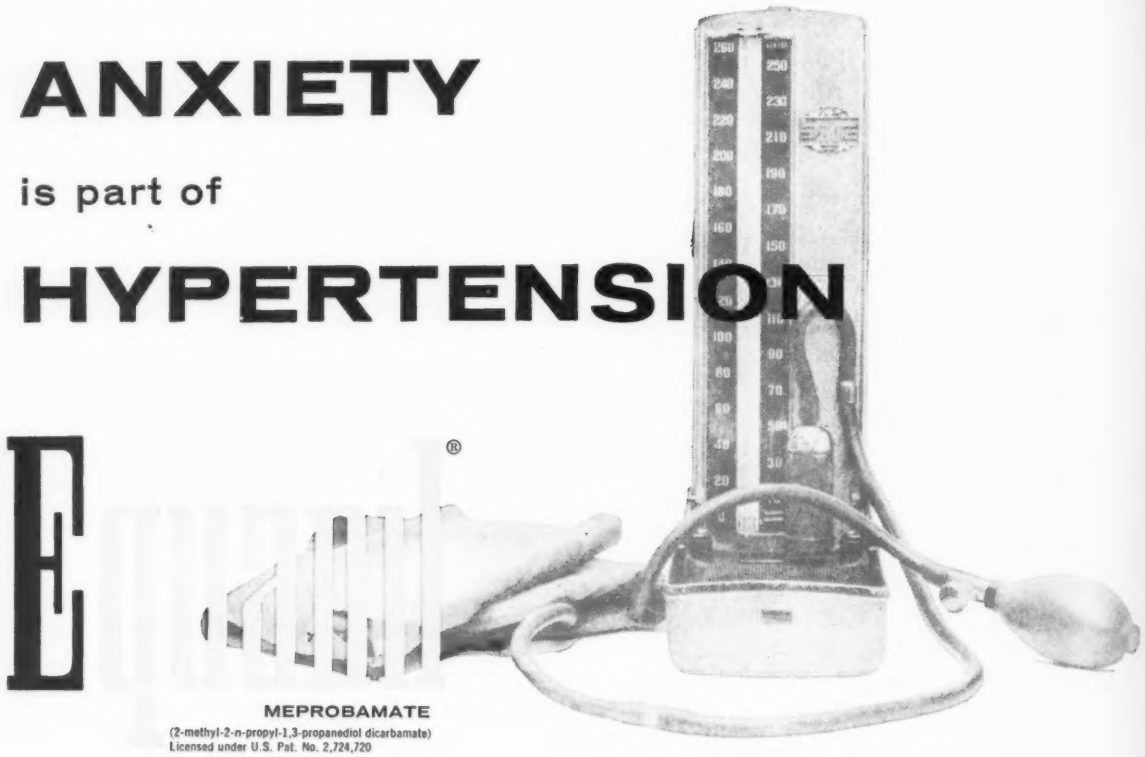
Schenlabs SCHENLEY LABORATORIES, INC · NEW YORK 1, NEW YORK

. . . part of *every illness*

ANXIETY

is part of

HYPERTENSION



EQUANIL®

MEPROBAMATE

(2-methyl-2-*n*-propyl-1,3-propanediol dicarbamate)
Licensed under U.S. Pat. No. 2,724,720

"... the relationship of emotional stress to the onset of hypertension and to the anxiety which is frequently responsible for the aggravation of existing hypertension are well known. Personality study of the hypertensive patient often reveals a deep-seated conflict which stands in close relationship to anxiety."[1]

Just as anxiety and tension are prominent facets of hypertension, so their control is a prominent part of total management. EQUANIL expands the usual antihypertensive regimen by combating the complicating emotional unrest. Without specifically altering blood pressure, EQUANIL relieves anxiety, lessens muscular tension, and fosters restful sleep.[2]

In every patient . . . a valuable adjunct to the customary therapy

Supplied: Tablets, 400 mg., bottles of 50.

Usual Dose: 1 tablet, t.i.d.

1. Weiss, E., and English, O.S.: Psychosomatic Medicine. W. B. Saunders Co., Philadelphia, 1949, p. 305.
2. Lemere, F.: Northwest Med. *54*:1098 (Oct.) 1955.

anti-anxiety factor with muscle-relaxing action

[redacted]

Wyeth®
Philadelphia 1, Pa.

A SMILE AGAIN IN JUST 12 DAYS WITH TIME-SAVING TRĪVA

the MODERN treatment for all 3 types of vaginitis

TRIVA effectively annihilates vaginal microorganisms, restores mucosal integrity and accelerates healing for rapid recovery.

Non-irritant, non-toxic, non-staining, TRIVA is a safe vaginal douche... even during pregnancy. Effective in any pH medium. Most cases of trichomonal, monilial and non-specific vaginitis become asymptomatic and organism free in 6 to 12 days. For complete data see Physicians' Desk Reference, 1956, page 427.

AVAILABLE AT ALL PHARMACIES, *in convenient packages of 24 individual 3 Gm. packets, each containing 35% Alkyl Aryl sulfonate, (surface-active, germicidal and detergent), 0.33% Disodium ethylene bis-iminodiacetate (chelating agent), 53% Sodium sulfate, 2% Oxyquinoline sulfate (bactericide, protozoacide) and 9.67% dispersant.*

Full treatment package and literature on request.

BOYLE

BOYLE & COMPANY, Dept. 01, Los Angeles 54, California

"Now this prescription may give you a stuffy nose. If it does, just get a 'Benzedrex' Inhaler. It will keep you comfortable until I see you next week."

An innocuous, yet definitely unpleasant, side effect of many relatively new preparations—certain antihypertensives, ataraxics, etc.—is nasal stuffiness.

When you prescribe one of these agents, rauwolfia, for example, you probably advise your patient that he should not be surprised if he gets a "stuffy" nose.

May we suggest you advise him, too, that if nasal stuffiness does occur, he can obtain quick relief with a 'Benzedrex' Inhaler? That he need not suffer nasal discomfort between his visits to your office?

'Benzedrex' Inhaler relieves nasal congestion in seconds; does not produce excitation or wakefulness.

Benzedrex* Inhaler

for your patients' use between visits to your office

Smith, Kline & French Laboratories, Philadelphia 1

*T.M. Reg. U.S. Pat. Off.

Formula: Each 'Benzedrex' Inhaler is packed with propylhexedrine, S.K.F., 250 mg.; and aromatics.

STRESSCAPS*

for
resilience
to
stress

ONE OF A COMPLETE LINE OF VITAMIN PRODUCTS
Lederle
FORMULATED UNDER RIGID QUALITY CONTROL FOR YOUR PRESCRIPTION NEEDS

Molehill situations quickly become mountainous to busy persons under persistent stress.

STRESSCAPS replenish the specific vitamin losses sustained by these individuals—increasing their resilience to daily stress, restoring their efficiency.

The STRESSCAPS formulation is based on the most recent knowledge regarding the vitamin requirements of the human body under stress.

drg filled sealed capsules

*Reg. U. S. Pat. Off.

Each Capsule Contains:	
Thiamine Mononitrate (B_1)	10 mg.
Riboflavin (B_2)	10 mg.
Niacinamide	100 mg.
Ascorbic Acid (C)	300 mg.
Pyridoxine HCl (B_6)	2 mg.
Vitamin B_{12}	4 mcgm.
Folic Acid	1.5 mg.
Calcium Pantothenate	20 mg.
Vitamin K (Menadione)	2 mg.

Average Dose: 1-2 capsules daily.

Lederle LEDERLE LABORATORIES DIVISION, AMERICAN CYANAMID COMPANY, PEARL RIVER, NEW YORK

when dandruff stands out as a sign

prescribe SEBIZON Lotion

for an extra therapeutic dividend

a method of choice for **rapid control** of seborrhea of the scalp and seborrheic dermatitis in children as well as adults...**no complicated shampoo or timing procedures:** patient rubs in SEBIZON any time of the day, washes out when convenient ...acts as hair dressing: **no odor, no oily or greasy residue,** no tinting of hair.

especially useful when dandruff escapes control again

antiseborrheic and anti-infective
SEBIZON is a cream-type vanishing lotion containing 10% sulfacetamide sodium.

available on prescription only in 3 oz. plastic squeeze tube.

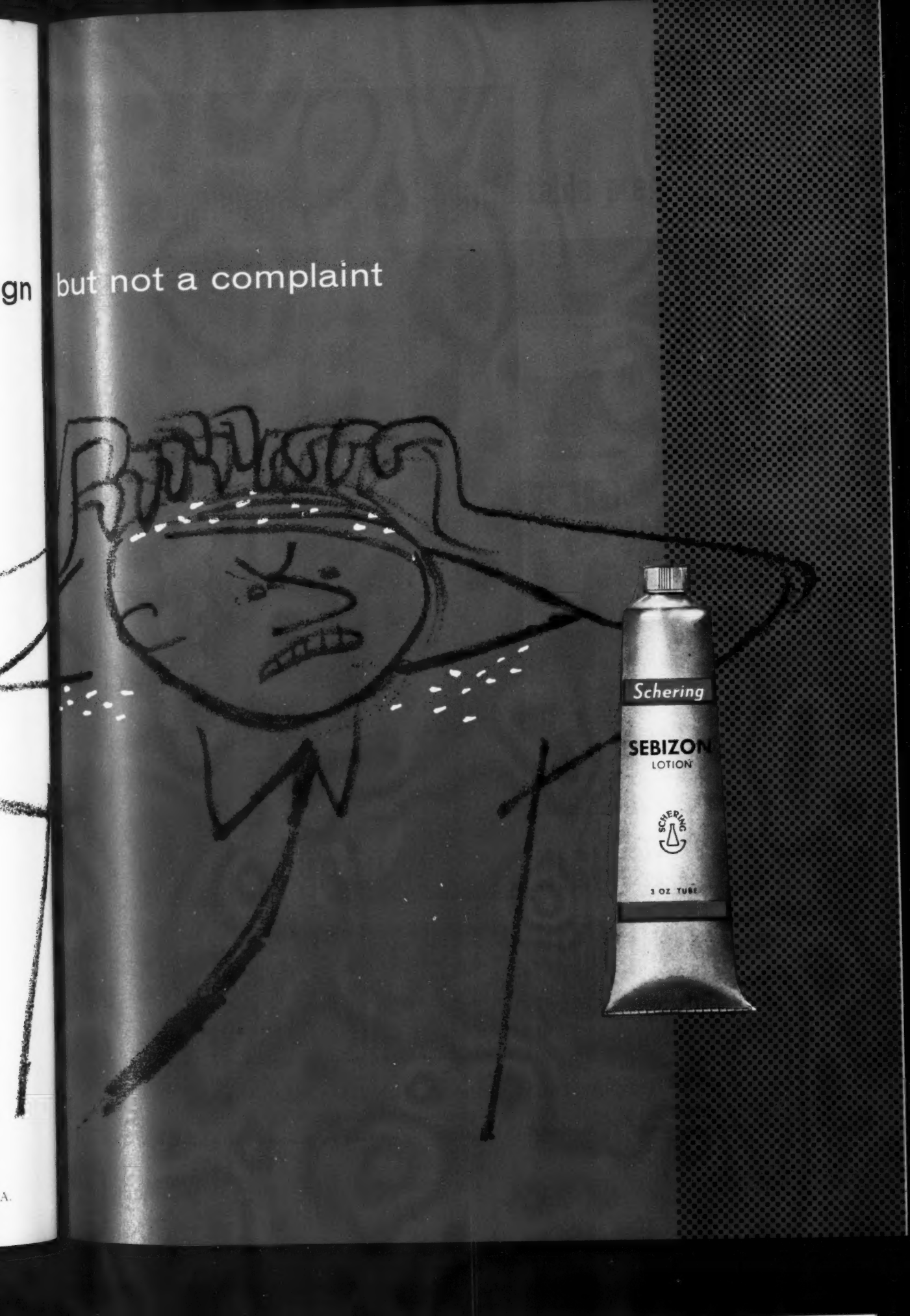
SEBIZON,® antiseborrheic preparation.

Schering

SZ-J-4106

gn

but not a complaint



A.

IN CONSTIPATION

SENOKOT, the large bowel neuroperistaltic, has a re-educative effect that affords gradual reduction in dosage and eventual discontinuance of medication. Unlike bulks, detergents or harsh cathartics, SENOKOT acts through neuromuscular resensitization of Auerbach's plexus—evacuating soft, well formed stools, and rehabilitating the constipated, languid bowel.

The effectiveness of SENOKOT is documented by a body of clinical and laboratory evaluations which constitutes the fastest growing bibliography in the field of constipation. Copies of this bibliography are available on request.

DOSAGE: Average starting dosage for adults is one level teaspoonful of the granules (or two tablets), preferably at bedtime. Dosage may be increased or decreased to meet the patient's specific needs.

TABLETS OF SENOKOT: Small and easy to swallow, in bottles of 100.
GRANULES OF SENOKOT: Cocoa-flavored, in 8 and 4 ounce containers.

Rehabilitate
the languid bowel

natural bowel corrective

Senokot

TABLETS / GRANULES

BRAND OF STANDARDIZED CONCENTRATED ACTIVE PRINCIPLES OF CASSIA ACUTIFOLIA POD

PF

The Purdue Frederick Company DEDICATED TO PHYSICIAN AND PATIENT SINCE 1892 135 CHRISTOPHER ST., NEW YORK 14, N. Y.

for normal, healthy, comfortable pregnancies

Walker
100 CAPSULES
PRECALCIN
LACTATE
A DIETARY SUPPLEMENT
FOR USE DURING PREGNANCY AND LACTATION
EACH CAPSULE CONTAINS
CALCIUM LACTATE Anhydrous 450.00 mg.
VITAMIN A Crystalline 2,000 U.S.P. Units
VITAMIN D_3 Crystalline 400 U.S.P. Units
THIAMINE HCl 3.00 mg.
RIBOFLAVIN 2.00 mg.
NIACINAMIDE 10.00 mg.
ASCORBIC ACID 30.00 mg.
CALCIUM PANTOTHENATE 2.50 mg.
PYRIDOXINE HCl 1.00 mg.
FOLIC ACID .33 mg.
VITAMIN B_{12} conc. activity equiv. to *1.00 mcg.
FERROUS GLUCONATE 100.00 mg.
TRACE ELEMENTS*
*As Added Micronutrients
MICRONUTRIENTS
Copper as Copper Sulfate .2 mg. Manganese as Manganese Sulfate .2 mg. Cobalt as Cobalt Sulfate .04 mg. Zinc as Zinc Oxide .2 mg. Magnesium as Magnesium Sulfate .2 mg. Molybdenum as Sodium Molybdate .04 mg. Iodine as Potassium Iodide .02 mg. and Fluorine as Calcium Fluoride .04 mg.
DOSE: 1 capsule three times daily, or as prescribed.
(SEE REAR PANEL)
WALKER LABORATORIES, INC.
MOUNT VERNON, NEW YORK, U.S.A.
Walker
100 CAPSULES
PRECALCIN
LACTATE
MOUNT VERNON, N.Y.

PHOSPHORUS-FREE, HIGH-POTENCY DRY-FILL CAPSULES WITH "BUILT-IN" ANTIANEMIA FACTORS

now with FLAVINOL™
33.3 mg. per capsule

Walker LABORATORIES, INC., MOUNT VERNON, N. Y., U. S. A.

Pfizer

a *new* alkaloid of rauwolfia—rescinnamine—for improved control of hypertension and tension...

- *the safer, better-tolerated antihypertensive and tranquilizing agent*
- *side effects are less frequent and less pronounced*

Tablets: *0.25 mg., 0.5 mg.*

unwind patients gently with new **MODERIL***

BRAND OF RESCINNAMINE

*Trademark

PFIZER LABORATORIES, *Division, Chas. Pfizer & Co., Inc.*, Brooklyn 6, N. Y.

two
patients
with
angina pectoris

...your treatment can make *the difference*

In angina pectoris: ". . . the difference between complete, or almost complete, absence of symptoms, or a prolonged illness with much suffering" may lie in routine prophylaxis with Peritrate.[1]

New studies continue to confirm the effectiveness of this long-acting coronary vasodilator. "Impressive and sustained improvement" is observed in patients on Peritrate therapy.[2]

Simple prophylaxis: Peritrate is not indicated to abort the acute attack (nitroglycerin is still the drug of choice). However, you can reduce or eliminate nitroglycerin dependence and provide continuing protection against attacks of angina pectoris with Peritrate. Prophylaxis is simple: 10 or 20 mg. of Peritrate *before meals* and at bedtime. Maintenance of a continuous daily dosage schedule is important for successful therapy.

Peritrate has been demonstrated to prevent or reduce the number of attacks, lessen nitroglycerin dependence, improve abnormal EKG findings and increase exercise tolerance.[3,4,5]

The specific needs of most patients and regimens are met with Peritrate's five dosage forms: Peritrate 10 mg. and 20 mg. tablets; Peritrate Delayed Action (10 mg.) for continuous protection through the night; Peritrate with Phenobarbital (10 mg. with phenobarbital 15 mg.) where sedation is required; Peritrate with Aminophylline (10 mg. with aminophylline 100 mg.) in cardiac and circulatory insufficiency.

Usual Dosage: 10 to 20 mg. *before meals* and at bedtime.

References: **1.** Rosenberg, H. N., and Michelson, A. L.: Am. J. M. Sc. *230*:254 (Sept.) 1955. **2.** Kory, R. C., *et al.*: Am. Heart J. *50*:308 (Aug.) 1955. **3.** Winsor, T., and Humphreys, P.: Angiology *3*:1 (Feb.) 1953. **4.** Plotz, M.: New York State J. Med. *52*:2012 (Aug. 15) 1952. **5.** Dailheu-Geoffroy, P.: L'Ouest-Médical, vol. 3 (July) 1950.

Peritrate®

(brand of pentaerythritol tetranitrate)

WARNER-CHILCOTT

Oatmeal

Presents No Digestive Burden

Its chemical, physical, and physiologic properties endow oatmeal with remarkable ease of digestion.

In a broad series of tests the average coefficient of digestibility for oat protein was found to be 76 per cent;[1] that for oat carbohydrate, 98 per cent;[1] that of oat fat ranged from 56 to as high as 100 per cent.[2]

Oatmeal, because of its eye appeal and pleasing taste, stimulates the flow of salivary and gastric secretions. Softly particulate in form, it is readily miscible with the digestive juices and presents a large surface area to enzymatic action, thus yielding rapidly to gastric and intestinal digestion.

Oatmeal promotes comfort and efficiency of digestion throughout the gastrointestinal tract. The small amount of cellulosic material apparently aids in the breaking up of the compact gelatinous food mass in the stomach, thus facilitating gastric emptying.[3]

Because of its chemical and mechanical blandness, its remarkable digestibility, and high nutrient value, oatmeal merits the physician's continued recommendation as a key dish of America's breakfast, not only in the normal diet, but also whenever dietary adjustment is therapeutically indicated.

---

1. Merrill, A.L., and Watt, B.K.: Energy Value of Foods...Basis and Derivation, United States Department of Agriculture. Human Nutrition Research Branch, Agricultural Research Service, Agriculture Handbook No. 74, March 1955, pp. 8, 9, 25, 32-43, 60-87.
2. McCance, R.A., and Glaser, E.M.: The Energy Value of Oatmeal and the Digestibility and Absorption of Its Proteins, Fats and Calcium, Brit. J. Nutrition 2:221 (1948).
3. McLester, J.S., and Darby, W.J.: Nutrition and Diet in Health and Disease, ed. 6, Philadelphia, W.B. Saunders Company, 1952, pp. 189-190.

Quaker Oats and Mother's Oats, the two brands of oatmeal offered by The Quaker Oats Company, are identical. Both brands are available in the Quick (cooks in one minute) and the Old-Fashioned varieties which are of equal nutrient value.

The Quaker Oats Company
CHICAGO

NEOBON®

TO FIGHT THE INROADS OF AGE

Current opinion stresses the importance of early recognition of the undesirable effects of aging, and adequate metabolic support of the body's fight against them.[1] NEOBON, by providing 4 factors PLUS 1, corrects all 5 of the recognized treatable causes of aging.

Gonadal Hormone Decline—NEOBON'S daily dose of 3 mg. Methyltestosterone and 0.018 mg. Ethinyl Estradiol offsets it.

Hematinic Deficiencies—NEOBON combats nutritional anemia and iron deficiency with essential hematinic factors.

Digestive Enzyme Deficiency—NEOBON supplies pepsin and pancreatin to insure proper absorption and utilization of foods—despite digestive "let-down" of aging.

Nutritional Inadequacy—NEOBON'S complete combination of essential minerals and vitamins replaces deficiencies inherent in the restricted diets of the aging.

PLUS—NEOBON'S new lysine, the amino acid that lifts low value vegetable proteins to the high grade quality found in meat and eggs.

NEOBON in bottles of 60 soft, soluble capsules; prescription only.

1. Klemme, H. L.: Clin. Med., October, 1956.

New NEOBON® LIQUID, a geriatric tonic providing gonadal and thyroid supplementation, improved carbohydrate and protein utilization, hematinic action, and mild antidepressant effect.

In 16 oz. bottles; prescription only.

PEACE of mind ATARAX® Chicago 11, Illinois

". . . best results were obtained with women 35 to 55 years of age, who complained of anxiety, insomnia, chronic fatigue and despondency."[1]

Many physicians have reported favorable results with 'Compazine' in the mild or moderate mental and emotional conditions often associated with the menopause.

For example, in a series of 84 patients, Knoch and Kirk report outstanding results in women 35 to 55. The authors state that after 'Compazine' treatment, these women "were no longer fatigued, were sleeping well, had increased energy and showed a lively interest in their surroundings."

'Compazine' is S.K.F.'s new tranquilizer and antiemetic for everyday practice.

'Compazine' has shown minimal side effects.

*Compazine**

a true tranquilizing agent

Smith, Kline & French Laboratories, Philadelphia

1. Knoch, H.R., and Kirk, R.: Proclorperazine—A New Agent for the Treatment of Psychic Stress, in manuscript.

*Trademark for proclorperazine, S.K.F.

A life-saver in poisoning cases

CLINICAL TOXICOLOGY OF COMMERCIAL PRODUCTS

MARION GLEASON
ROBERT GOSSELIN, M.D.
HAROLD C. HODGE, PH.D.

Department of Pharmacology, University of Rochester School of Medicine and Dentistry

Because it answers the following questions:

→ What shall I do right away?
Section I: First Aid and Emergency Treatment

→ How deadly is the ingested chemical substance?
Section II: Ingredients Index (Over 1000 chemical substances with their toxicity ratings.)

→ How shall I treat the patient once I know what he's taken?
Section III: Therapeutics Index

→ What is the follow-up therapy in a given poisoning case?
Section IV: Supportive Treatment

→ What do trade name products contain?
Section V: Trade Name Index (Toxic ingredients are indicated by an asterisk.)

→ In general, what do classes of products (i.e., floor waxes, etc.) contain?
Section VI: General Formulations

→ If the label doesn't tell what's in the product, how can I get in touch with the manufacturer?
Section VII: Manufacturers Index

Approximate price $12.50 (includes supplement)

Can you really afford to be without it?

THE WILLIAMS & WILKINS COMPANY
Mt. Royal and Guilford Aves.
Baltimore 2, Maryland

Please send me a copy of CLINICAL TOXICOLOGY on 10-day approval when it is available (about February 1957). Bill me at that time.

READY FEBRUARY 1957—RESERVE YOUR COPY NOW!

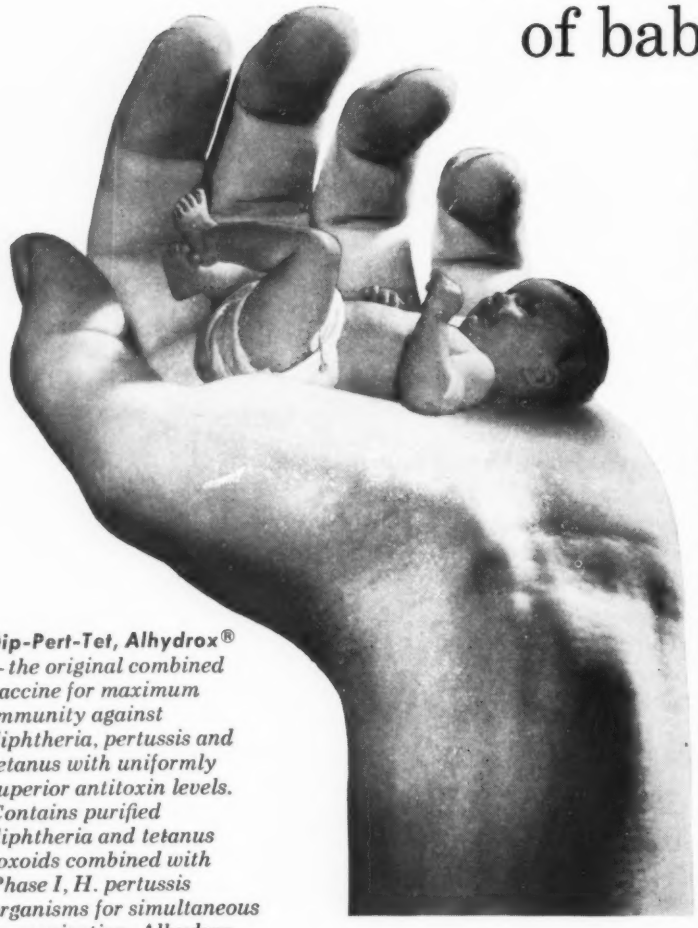
NAME_____

ADDRESS_____

CITY_____ STATE_____

JAOA—1-57

"a thimbleful of dosage for a handful of baby"



2.5 cc. Hypertussis eliminates massive dosage in whooping cough treatment or passive prevention. A crystal-clear homologous protein, 2.5 cc. Hypertussis contains the gamma globulin equivalent of 25 cc. of human hyper-immune serum. This specific anti-pertussis fraction is concentrated 10-fold to obviate the pain and inconvenience associated with massive dosage – giving you the advantage of "a thimbleful of dosage for a handful of baby."

Hypertussis will not interfere with the use of antibiotics where they may be indicated.

2.5 cc. Hypertussis is supplied in 2.5 cc. (one dose) vials, ready for immediate intramuscular injection.

Dip-Pert-Tet, Alhydrox® *– the original combined vaccine for maximum immunity against diphtheria, pertussis and tetanus with uniformly superior antitoxin levels. Contains purified diphtheria and tetanus toxoids combined with Phase I, H. pertussis organisms for simultaneous immunization. Alhydrox (aluminum hydroxide) is added to delay absorption. Try it and you'll see why there is only one Dip-Pert-Tet, Alhydrox.*

for whooping cough prophylaxis and treatment specify 2.5 cc. HYPERTUSSIS®

(anti-pertussis serum-human)

SINCE CUTTER 1897

CUTTER Laboratories
BERKELEY, CALIFORNIA

The JOURNAL of the AMERICAN OSTEOPATHIC ASSOCIATION

Jan. 1957 Vol. 56, No. 5

OSTEOPATHIC RESEARCH:

Why, what, whither?

An examination of its content, direction, and relation to the function of osteopathic medicine*

IRVIN M. KORR, Ph.D.
Department of Physiology and Pharmacology
Kirksville College of Osteopathy and Surgery
Kirksville, Missouri

DURING MUCH OF THE life of the osteopathic profession, the bulk of its resources and its energies as an organized profession has been devoted to winning the rights to practice and to teach according to its own principles and to developing the facilities and personnel for carrying out those two functions. In the face of the profession's limited resources, only relatively slight attention has been given in the course of this struggle to further exploration and development of osteopathy's special contribution—of its principles, of the biologic phenomena with which it deals, and of the practical implementation of those principles.

This struggle for recognition and rights to extend and deliver its services is rapidly approaching victory. More and more material and human resources can therefore be liberated, and more and more become available, for pursuit of the relatively neglected phase of professional life—research and development at the scientific and clinical level. It is therefore timely, indeed urgent, that the osteopathic profession thoroughly examine its obligations and its opportunities in this area. This paper is intended to be a small contribution to this exploration. In the available space we can only identify some of the key questions and indicate some of the directions in which to seek the answers.

The "why" of my three-part question is related to the importance which is attached by the profession to the accumulation of new knowledge and understanding for the fulfillment of its function. The "what" of osteopathic research is determined by what the profession considers to be its function and the nature of the osteopathic contribution. The "whither"—the direction of osteopathic research—is inseparable from the "what" and will be determined by the long-term objectives which the profession declares for itself in service to society and by the direction of the progress which it aspires to make.

*Based on a talk presented at General Sessions, Annual Convention of the American Osteopathic Association, New York City, July 17, 1956.

Research and the function of osteopathic medicine

The Purpose of Research.—

Why *should* the osteopathic profession now turn all possible resources to research? Let us immediately eliminate answers too frequently given or implied. Research is *not* done to impress, to win recognition, prestige, or financial support or even to prove one's contentions. Welcome as these may be as by-products of good research, when they become the *primary* objectives of research they defeat its very purpose. Research has only one purpose: the securing of reliable information and understanding about those aspects of nature in which one is interested or in which one seeks greater power of prediction and control—in this case, human health and disease.

It was so well expressed by Francis Bacon three and a half centuries ago: "Human knowledge and human power are coextensive; for ignorance of causes prevents us from producing effects. Nature can be ruled only by being obeyed; for the causes which theory discovers gives the rules which practice applies." For nature to be obeyed—and thus ruled—it must first be understood. Today, it is almost universally agreed that the road to control over human health lies only through widening and deepening of our basic knowledge of human nature and human biology in all their aspects. The only debate, in view of the increasingly pressing problem of human disease, is around this issue: Of *what* does "control" consist, in what *direction* does it lie, and through *which* of the unexplored fields of basic knowledge is the route most certain and direct?

The Debate of the Issue.—

It is around this issue and around this issue alone that divergent schools of medical thought arise. The differences are usually of such a nature that they are, as a matter of course, debated and tested *within* the existing school or schools of medicine. However, a school of thought, convinced of its essential validity, may find it necessary to organize itself into a new profession—a separate school of practice—when its position on this issue is dismissed without consideration by the existing schools of medicine, when the existing

schools will not debate the issue or, as is most usually the case, when they do not even recognize the existence of an issue. This is the only reason for the existence of the osteopathic profession. Its hypotheses, only superficially examined, were dismissed as dogma and its practice as cultist. Need and justification for a separate school of medicine continue as long as the issue remains and as long as that school's approach is not adequately considered, tested, or applied by other schools.

The profession fulfills that need—and therefore justifies its continued existence—only so long as it assumes full responsibility for the application of its approach and methods in practice, for training succeeding generations of physicians for such practice, *and for continuous exploration and development through research.* It must continue those responsibilities until such time as the prevailing school of medicine is prepared to accept at least the potential validity of the osteopathic approach and to assume or share these responsibilities. This, however, will involve a basic reorientation of medicine to a different viewpoint —or at least to the incorporation of a different viewpoint—from that which it appears to reflect today. That day is not yet here, but it is on the way. The osteopathic movement is successful to the degree that it hastens that reorientation.

The Precious Drop in the Ocean.—

Research—of the largest possible scope—is an inescapable responsibility of the profession because a vast amount of knowledge and understanding remains to be disclosed and developed which is absolutely indispensable to the doing of the job which the profession has set itself—and for which it came into existence. We must frankly face the fact that advances in understanding and control of factors and phenomena to which osteopathic medicine ascribes critical importance have been minute as compared with biologic and medical advance in general, and, indeed, as compared with the advances of the osteopathic profession itself. As was stated at the convention of this Association 8 years ago:

> The time has come . . . when increasing attention must be given to the theoretical reserves upon which continued technical advance is predicated. For many reasons these reserves have been consumed far more rapidly than they have been replenished. In osteopathy, as in all technological aspects of modern life, large backlogs of fundamental information must be maintained and enlarged if continued practical advances are to be assured. They are, indeed, the springs from which the advances flow.[1]

The following protest may be made, as it has been, by some who continue to view research as a luxury ill-afforded by the osteopathic profession, rather than as an inescapable obligation and opportunity: They point out that a tremendous volume of medical research is already in process throughout the world involving investments of billions of dollars and tens of thousands of individuals working in thousands of institutions. They remind us that much of the product of this research is available to, and incorporated in, osteopathic education and practice. The contribution made under osteopathic auspices, even under the best of circumstances, can be but a drop in that vast ocean. Of what importance can that drop—or any drop—be in such an ocean?

In the first place, total research progress is made up of countless contributions ranging from minute in scale to grand in magnitude. Second, while some kinds of investigations can be conducted only on the grand scale and while, given other essential factors, the more the research the faster the progress, magnitude is not what counts. It is one or more of such elements as the following that give importance to any research and its products: the significance of the contribution, its total impact on knowledge, the meaning it imparts to a previously accumulated mass of facts, the clarity it brings to an area of confusion or ignorance, its catalytic effect on the growth of understanding, the breadth of generalization it makes possible, the number and importance of peripheral problems whose relations it reveals and to whose unified comprehensive solution it offers an approach, the new problems it raises and the new inquiries it stimulates, the new or refined control and prediction it makes possible. In short, important as is the scale of operations, what counts is the magnitude of the secrets that the research unlocks—the unraveling it makes possible.

We may draw a simile from research and technology themselves. It requires but one crystal, of special nature, at the right time, under the proper circumstances, to release from solution, for harvesting, precious crystals of enzyme, hormone, or virus hidden within an accumulation of complex amorphous extracts. It requires but a relatively minute quantity of chemicals, of proper nature, to clarify a large body of turbid water and thereby reveal new worlds of phenomena and previously unseen relationships.

And so it is with research. "Drops" of research have again and again in the past clarified vast reservoirs of accumulated knowledge, brought new areas to light, given new meaning to old areas, and revealed that many apparently unrelated islands of knowledge were but the superficial projections of a common, deeper-lying base. The research must ask totally new questions of nature or old questions in a new way. Osteopathic research *is* concerned with areas not now recognized or adequately explored by others, and with unrecognized connections among areas that *are* being explored. It does ask a new kind of question and therefore seeks different kinds of answers. These answers have a special and urgent pertinence to human health at this particular stage of civilization.

Questions and Answers: Unasked, Unanswered.—

Granting the importance of those answers, it may still be protested that their quest is an unfair and an intolerable burden upon the profession's limited resources. Why not leave it to those who are already richly equipped, staffed, financed, and experienced to accommodate this drop in their ocean?

The reply is simple. The answers will not come unless they are sought, and they will not be sought unless the *seeker* himself asks the right questions and asks them in the right way. The answers which osteopathy seeks cannot emerge in the course of or as by-products of investigations into other questions. Answers to unasked questions are not answers at all; answers to questions incorrectly asked are wrong answers, regardless of the validity of the observations or the precision of the measurements upon which they are based. They are only data whose meaning must await the asking of the correct questions. This is what Pasteur meant by the "prepared mind."

The questions which osteopathic investigators ask and should ask emerge from hypotheses whose essential validity is demonstrated at least to the satisfaction of osteopathic physicians and their patients. Were these questions being asked with sufficient frequency and clarity in nonosteopathic institutions, it could be only because the central hypotheses constituting the os-

teopathic concept were being given sufficient consideration and credibility to merit further testing and exploration. Were that true, all need for a separate profession would have been eliminated.

Questions as Products of Prevailing Perspectives.—

Why are the questions which are central to osteopathic theory and practice not being asked with adequate frequency and thoroughness in all of the medical research that is going on? Certainly, it is not for the want of traditional academic freedom, the freedom of the individual investigator to follow his own interests or curiosity.

The point is that questions asked by individual investigators are fragments of the larger questions asked by biologic and medical science as a whole. These, in turn, to a larger degree than is commonly recognized, are stimulated and formulated in accordance with a prevailing, though undefined, orientation with respect to questions of health and disease, and in accordance with the problems which are identified (and the way they are defined) in the course of clinical practice. Each individual investigation is, so to speak, an eddy current derived from and contributing to the prevailing wind, speeding it somewhat, occasionally deflecting it a little.

The issue is not whether the prevailing wind is an ill wind, which it most certainly is not, having brought, especially during the past half-century, rich treasures of medical advance and new understanding for which all humanity is grateful. The issue, rather, is whether *enough* of the answers to human health problems lie along its projected path; whether the prevailing orientation, central hypotheses, and objectives point the best possible path. The osteopathic approach represents—as yet—a zephyr in quite another direction, a basic deflection from the original path. Its propulsive force cannot achieve full development or be adequately utilized until there is some reorientation of the prevailing wind in its direction. This can be achieved in no other way than by objective, irrefutable demonstration of the promise that lies along the osteopathic path.

In other words, osteopathic questions are not being sufficiently asked of nature outside of the osteopathic profession because they do not spring from the prevailing conceptual framework in which medical practice and research are oriented; the "need" for the answers is not sufficiently recognized and even the answers which *are* disclosed lose meaning in the prevailing contexts.

This is not to say that medical research is barren of the answers which osteopathic investigators seek and would seek. Nothing, as we have repeatedly shown,[1-4] could be further from the truth. While virtually all aspects of biology have some pertinence to osteopathic thought, practice, and research, medical and biologic literature is replete also with important parts of the special answers which we would seek. But because they arise in response to other questions, their significance is missed or altered and, because the comprehensive conceptual framework which encompasses these fragments is not recognized, the links among the fragments are not perceived and they remain miscellaneous fragments in widely scattered fields of investigation. When, however, the links are revealed with the aid of a cohesive, comprehensive framework, these fragments are seen to represent a major new trend in medicine—one envisioned in the osteopathic approach.

Prevailing Medical Perspectives.—

It is not possible at this time, nor am I personally qualified, to undertake an analysis of the basic perspectives, the conceptual framework, the central hypotheses, and the objectives which appear to guide the dominant school of medicine and which serve as points of departure for medical investigation. This has been admirably done by a number of writers within and without the medical profession,[5-14] and their views may be summarized as follows.

While many informed medical leaders and educators point out that it is not enough, it is difficult to escape the generalization that the function of medicine is viewed as the combating of disease. The basic strategy appears to incorporate the following elements: (1) the careful characterization of each disease and its manifestations so that, in diagnosis, one may be distinguished from another and the progress and severity of each case may be evaluated; (2) the search for the cause or causes of the individual diseases; (3) the identification and description of the processes involved; (4) the search for and devising of expedients to attack the causes and/or to modify the processes involved—the more specific to the disease, the better; (5) the alleviation of the manifestations and sequelae of the disease; (6) prevention of disease by specific measures and through detection and treatment of early signs of diseases.

The road to human health, from this viewpoint, is in the elimination of man's diseases, one by one, group by group, through understanding each more minutely. Modern medicine, therefore, is commonly described, sometimes in pride and sometimes in criticism, as etiological and curative (remedial), with occasional speculative glances in what are termed ecological directions.

Prevailing Perspectives in Medical Research.—

In accord with this strategy, medical research, certainly that massive portion with deliberate or recognizable clinical implications, is predominantly directed at understanding of the identifiable diseases, their causes, mechanisms, processes, and distinctions and at developing technics for recognizing, evaluating, and modifying them and their manifestations. Since diseases, for the most part, are referable to specific cells, tissues, organs, and processes, the microscope of biologic and medical research has been turned with ever-increasing concentration and with more and more minuteness and precision upon these and their experimental and pathologic alterations, until it has become one of the most proudly avowed objectives of modern medical science to explain man and his diseases in molecular terms, in terms of his most elemental component parts and processes, in terms of physics and chemistry.[15-17]

It would serve no useful or just purpose to criticize these vast and obviously successful efforts, nor to minimize their importance to our understanding of life and to the control of health. The only issue, again, is whether this approach is the only—or the best—approach to human biology and to the building of human health, indeed, to the conquest of disease. Medical achievements of recent years have been so numerous and so dramatic that the possibility of another—let alone, a better—approach hardly seems thinkable or necessary. The implicit assumption prevails that we need only to prosecute this approach long enough and intensively enough, and inevitably all of the technical answers to human health needs will come.

It is appropriate to ask, however, as many are now asking, whether the microscope, figuratively speak-

ing, is the best instrument with which to acquire perspective, whether minute study of disease can ever yield a comprehensive understanding of health; whether the examination of isolated factors and phenomena in controlled experiments,[18] indispensable as they are to biologic study, can ever reveal that world of phenomena which is the product of the uncontrolled interplay of many factors, and in which the biologic impact of each factor is continuously modified by the changing constellations in which it operates.

It is appropriate to ask whether human health and its control can ever be achieved through study of the parts and processes, large and small, which man shares with other animals—without searching attention to the peculiar demands that human life and individual lives place upon these mechanisms. Can satisfactory understanding of these mechanisms in man ever be achieved outside of their operational context, the circumstances under which they are required to operate, the adaptations to which they are required to contribute, the abuses to which they are exposed, and all other factors associated with human organisms and arising in human life? What of the peculiarly human factors which modify and impair the operation of these parts, processes, integrative mechanisms, and molecular reactions, causing health to fail—and diseases to emerge? It is important to question whether the road to health lies through treatment of these diseases rather than through control of the factors of which diseases are the product, to which, indeed, they are adaptations. It is appropriate to ask whether the most minute study of peptic ulcer, for example, can ever do more than tell about peptic ulcer, without revealing what ails the man who has one, now why is it *his* biologic adaptation to the life that he lives: whether, indeed, minute study of the *ravages and debris of defeat* of the human organism, of the *adaptations to defeat*, and of *all the kinds of defeat* can ever lead to the origins and nature of human *defeatability* and therefore toward its control.

The relevance and validity of these questions have become increasingly sharp, and the etiological and curative approach has been more and more shaken in recent years with the emergence of the chronic degenerative diseases. The chronic degenerative diseases have increased with alarming rapidity as the infectious diseases have subsided and are, as former Surgeon General Scheele stated, the "major front" today. These diseases, chronic in origin as well as in duration, are the product of whole lives in all their aspects, the products of inadequacy and maladaptation of the human being to the total life that he lives and has lived. To view them as the "effects" of specific "causes" which need only to be identified, isolated, and destroyed and for which "cures" only await discovery is to deny their very nature. As Dubos and others[19-21] have pointed out, human differences are no less important in the infectious diseases, despite the participation of specific, identifiable causative agents.

In the face of the tremendous accumulation of established disease—of "defeated" organs and tissues—which confronts the physician today, it is certainly his obligation to use the best palliative, curative, and preventive methods at his disposal; and under the exigencies of daily practice this may be the only obligation he can fulfill. Of this there can be no just criticism. We can, however, question with considerably more validity whether research which also remains, directly or indirectly, disease-oriented can ever yield the comprehensive answers which today's health needs demand. These questions gather new meaning as we watch the growth and multiplication of vast research programs, public campaigns, foundations, institutes, and departments for the study of individual diseases or groups of diseases, and so few for the study of factors, features, origins, and mechanisms which they have in common.

The Osteopathic Questions.—

The osteopathic orientation is implicit in these questions. This orientation is not, nor was it ever, the exclusive creation of the osteopathic profession. Parts of it have been recognized for centuries and it is more often and more comprehensively expressed today than ever before. However, commonly as it is proclaimed, and frequently as it is the theme of prefaces and forewords, it has yet had little impact on medical practice and virtually none on basic medical research. Its holistic, organismic, and ecological implications are disdained by medical scientists, largely preoccupied with the "molecular" and "microscopic" approaches, as being more within the realm of medical art than of science.

It is only within this organismic conceptual framework that the conspicuously distinctive contribution of osteopathy, namely, the recognition of musculoskeletal factors in health and disease and their manipulative management, has its meaning. Only within this framework can it be intelligible, interesting, and challenging as an area for investigation. Squeezed into the framework of etiological and curative medicine it is (justly, in my opinion) rejected as a preposterous incongruity.

For these reasons and for others derived from them, the biologic questions which osteopathic medicine raises—and for which the profession came into existence—are still not being sufficiently pursued in non-osteopathic institutions, nor are they likely to be in the immediate future. Because of the bearing of these questions on the understanding of human biology and on human health and its control, it is the inescapable obligation of the osteopathic profession to pursue them with maximal and ever-increasing intensity. This is the "why" of osteopathic research.

The content and direction of osteopathic research

Osteopathic Concepts vs. Working Hypotheses.—

Let us now turn to the "what" and "whither" of my three-part question. What is osteopathy's conceptual framework? Osteopathic concepts of health and disease—as bases for thought, teaching, and discussion and as guides for practice—have been stated many times in different ways. Each physician develops his own whether or not he verbalizes them. For these purposes and according to various standards, various versions have served more or less adequately.

The greatest value, however, of any hypothesis or body of hypotheses, such as osteopathic concepts are, lies in the degree to which it stimulates and guides further inquiry, the degree to which it identifies areas for, and directions of, investigation—in short, in the degree to which it guides its own unfolding. I think we cannot escape the conclusion that, *as it is commonly expressed*, the osteopathic concept has not served well in this regard.

As it is commonly expressed—primarily for physicians and physicians-to-be—biologic scientists find little in it to stimulate, challenge, or excite their ordinarily restless curiosities, certainly not enough to divert them from areas of investigation which they already

find engaging and to which they eagerly dedicate their lives. To the biologic scientist, statements of the concept appear to consist partly of generalizations so broadly stated and so self-evident that they offer little to examine, to doubt, to test, or to question, and partly of references to vaguely defined phenomena which, for him, either do not exist or appear of isolated and trivial biologic interest. Already presented with more possible and worth-while research problems than he can attack in a lifetime, he is understandably unattracted to phenomena of whose existence he has no certainty and, in any case, whose connections with identifiable phenomena and problems he does not perceive. It is as though he were asked to scrutinize a shadow by turning a bright light upon it.

In short, *as commonly expressed,* the osteopathic concept asks no clear questions, presents and identifies no problems, is neither stimulus nor guide to research and to its own unfolding. The present generalizations or basic biologic laws, such as those regarding the unity of the body, the intrinsic capacities of the human body, and the oneness of structure and function, *appear* to be trite, self-evident axioms and therefore not areas for investigation, only because their biologic implications have never been adequately explored. Indeed, it is my belief that herein is one of osteopathy's largest potential contributions to the biologic sciences. It is not that osteopathy recognizes and "obeys" different biologic laws, but rather—at least at the clinical level—that it has more deeply explored and applied the *implications* of those universally recognized laws.[22] Principles which have become guides to osteopathic practice remain but pious banalities for others. The unexplored areas and directions of inquiry which they encompass need, therefore, to be identified.

Labels regarding factors and phenomena, such as "structure," "structural integrity," "osteopathic lesion," et cetera, which have widely diverse, though somewhat overlapping, meanings for those relatively few persons who have clinical experience with the phenomena, have no meaning for the preponderant segment of the biomedical world which does not have direct experience with them. A biologic entity which is variously viewed as (1) a vertebral strain, (2) a subtle subluxation, (3) an error in locomotion, (4) a complex response of the entire person focalized through a portion of the spinal cord, (5) a facilitated segment, (6) a palpable alteration in the paravertebral tissues, (7) anatomic displacement of one or more vertebrae, (8) disturbances in spinal kinesiology, (9) a postural stress, (10) the body's *response* to a postural stress, (11) any structural abnormality which disturbs function—and possibly hundreds of others—is, as such, hardly an identifiable subject for investigation.

It is as though, of a group of biologists setting out to investigate and determine the nature of the elephant, one scrutinizes the tail, another the trunk, the third the ear, the fourth a leg or tusk, and still another the trumpeting of the elephant or the vibrations of the earth as it runs by or the screams of other frightened animals—each in the belief that *that* is *the* elephant!

The Development of Working Hypotheses.—In my opinion, then, this is a task of highest priority: The restating of osteopathic principles in terms of basic biologic issues and problems and in the context of today's and tomorrow's health needs. Noncommittal idioms and labels, developed when knowledge of biologic mechanisms was meager, and conveying many private meanings or none at all, need to be translated into, or related to, phenomena which have been and can be identified and recognized in the biologic and medical sciences.

It will avail nothing from this viewpoint, however, merely to set out to restate *"the* osteopathic concept" in other words and to define and redefine *"the* osteopathic lesion." We need to spell out the derivations and extensions of these generalizations and their implications to various fields and aspects of the biologic sciences. We need to identify the categories of biologic phenomena, factors, mechanisms, processes, components, relationships, and interrelationships which are or appear to be related to the "osteopathic lesion," which have or appear to have a bearing upon it, and upon which the lesion has or appears to have a bearing. (See, for example, recent papers by Wright[3] and Thomas.[4]) Only in this way can the interest and participation of biologic scientists be won, and only in this way can they begin the formulation of their own specialized conceptual frameworks to guide their contributions to osteopathic theory, practice, and education.

This can be accomplished only through close collaboration between qualified biologic investigators and osteopathic physicians who have rich backgrounds in osteopathic theory and practice and, as far as possible, in research. Their objective should be, not the development of a satisfying "statement," but a body of working hypotheses which invite, through investigation, their own revision, elaboration, and even replacement. Even with our present limited knowledge, I believe it is now possible to do a sufficiently satisfactory job that qualified biologic and medical scientists would, upon studying those hypotheses, not only find them challenging, but also find the places where they could make their best contributions.

In the absence of such a body of hypotheses, a qualified investigator who, let us say, through having joined the faculty of one of the osteopathic colleges, is presented with the opportunity (or obligation) to "do osteopathic research" does not readily find his way "in," and does not readily identify "osteopathic" problems within his specialty to which he can gratifyingly apply his talents and knowledge. He must, therefore, with such guidance as he obtains at the college, construct for himself a hypothesis, a personal interpretation of some aspect of the osteopathic concept, adequate at least to enable him to formulate a problem in his field. In essence, he identifies some "unknown" pointed to by *his* interpretation of osteopathic theory and endeavors to relate it to some "known" in his field. The soundness and comprehensiveness of his concept, there-

Osteopathic research is concerned with areas not now recognized or adequately explored by others, and with unrecognized connections among areas that are being explored

fore, significantly influence his selection of the area of the investigation and of the approach, and the value of the investigation.

In similar manner, we, the full-time professional staff of the Department of Physiology and Pharmacology at the Kirksville College of Osteopathy and Surgery, consisting at present of four professional physiologists and two D.O.'s who have *become* professional physiologists, have had to construct our own osteopathic concepts to serve as guides and conceptual contexts for our work. We were fortunate in the fact that research had long been an important activity at the Kirksville College of Osteopathy and Surgery and that we could have a sound introduction to osteopathic theory from an investigator's viewpoint. Over the years these "departmental" concepts have undergone many revisions and elaborations as our understanding has grown and as new knowledge—from researches all over the world, including our own—has accumulated.

At each stage, our endeavor has been not only to construct limited frameworks for our own immediate investigations, but also as perspectives for our teaching of the physiologic sciences. Moreover, we have tried to interpret and reinterpret the osteopathic concept in such a way that it would be meaningful and even challenging to biologic and medical scientists who have had no prior contact with osteopathy and in such a way that scientists in any basic medical field could be stimulated to, and enabled to, design sound projects utilizing their particular backgrounds of training, talent, knowledge, and experience. How well our hypotheses have served, only time will tell. We can certainly say that newcomers to our department have been able to find their places, so to speak, relatively quickly.

Osteopathic journals have been most generous with the space they have made available to us to conduct, in public, these personal exercises in self-expression. Since our concepts, at various stages of development, have appeared in these journals over a period of years (see References 1 to 4, 22, and other references therein), there is no need to restate them in detail. I wish only to restate those essential points that lead to the identification (a) of promising but relatively unexplored areas of physiology and related sciences and (b) of previously undisclosed relations between areas already under exploration.

One Working Hypothesis.—

There are many factors, in human life, the human environment, and human biology which influence the capacities of the human organism to meet the demands of life, to meet stress, and to adapt to, resist, combat, and compensate for unfavorable elements in the environment—in short, to maintain and recover health. These vary from individual to individual. The influence or impact of a given factor in a given individual is determined not only by the quality and quantity of that factor but also by the total constellation of factors at the time and in the past. An individual's health, his responses, and capacity for adaptation to various environmental factors, life situations, and demands, his vulnerability, "defeatability," susceptibilities to illness, capacity for recovery, et cetera, are therefore the products of his entire life. Hence, the importance and influence of any given factor may vary from individual to individual and from time to time in a particular individual.

Whatever his other functions, it is the essential function of the physician to promote, develop, liberate, and restore, insofar as possible, these capacities in those individuals for whose health he is responsible. He does this by analyzing and altering the factors in a favorable direction, minimizing those which impair these capacities. Of all possible factors only a relatively few, at least with our present knowledge, are readily subject to human control. Of these only a few have a major or decisive influence on health.

The osteopathic profession attaches special importance to the unfavorable factors arising in the musculoskeletal system for the following reasons:

1. Local disturbances, particularly in the axial portion, of the musculoskeletal system have a peculiarly high incidence in man because of the special demands made by gravitational forces on the erect musculoskeletal system.

2. Through the circulatory and nervous systems there is, in health and disease, rich interchange of influences between the musculoskeletal system and other tissues and organs.

3. A disturbed portion of the axial musculoskeletal system, therefore, impairs to some extent, and/or reflects impairment of, functions of other tissues and organs; those with which it is most closely related neurologically are most directly affected.

4. Regardless of its origin, whether primary or secondary, the musculoskeletal disturbance impairs the capacity for resistance and recovery and tends to promote and sustain existing disease processes.

5. Such a functional disturbance represents a point of high vulnerability even in the apparently healthy human organism, whose effect on the total man is influenced by many other factors in his life.

6. These localized disturbances in the musculoskeletal system and the responses to them are readily detectable, even in the absence of subjective symptoms or disease.

7. They are readily accessible to direct and specific modification and treatment.

8. They are responsive to appropriate treatment.

9. The strategic importance of this physiopathologic disturbance, then, appears to lie in the following circumstances:

Regardless of its real or apparent relation to any symptoms or identifiable disease in a given individual:

a. To some extent it impairs and taxes the capacities defined above;

b. It exaggerates or unfavorably modifies the impact of all other factors;

c. Its treatment, therefore, tends to insulate the individual against the unfavorable factors in his life, in his environment, and in himself, rendering them less deleterious to his biologic capacities and resources.

d. It is detectable, and accessible and responsive to treatment.

e. Prevention, early detection, and treatment of this disturbance offer a valuable approach to the prevention of ill health as well as to therapy.

Identifying Areas for Investigation and their Connections.—

Through our continual examination of the physiologic implications of osteopathic principles as we interpret and reinterpret them, key areas in need of investigation have become identified. They are areas which we have been able to identify and characterize from our specialized and relatively limited viewpoint as physiologists—in effect, questions to which we have found *we* need the answers. The same could be done, and needs to be done, by specialists in the other basic medical sciences.

It is important to emphasize that our concern is not alone with areas which are now unexplored. It is

just as important to recognize those aspects of the biologic and medical sciences which are or have been under active investigation, but whose bearing on osteopathic theory and practice has not previously been recognized and to which new meaning may be brought by osteopathic theory. An important part of that new meaning is in the *interrelations* among apparently isolated areas which are thereby disclosed. In disclosing the bearing of a given field or aspect on osteopathic theory and practice, a whole body of knowledge, usually still growing, is, as it were, incorporated into osteopathic theory, practice, and research and continues to enrich them and to be enriched by them.

Similarly, the disclosure of interrelations and connections among presently isolated fields opens up channels of interchange in which each field draws from and gives to the others new and broader meaning, while their combined impact on knowledge and human power is enlarged. Indeed, I have felt for a long time, that one of the greatest potential contributions of osteopathic theory to the biologic sciences lies in the cohesiveness which it imparts or makes possible among many disciplines and fields of knowledge and technic; in the dissolution of walls, separating scientific and technical fields, which exist only in the minds of men and not in nature itself; in revealing the common deeper-lying bases which tie together apparent islands of fact and knowledge; in the opening of new media of exchange among many fields.

Some Illustrative Areas.—

Following are but a few of the areas identified by one group of physiologists in one of the osteopathic colleges. These are intended to describe not individual research projects but vast areas in need of exploration.

1. The physiology of human differences:

While we need to continue to accumulate ever more knowledge, for example, about *the* adrenal cortex, *the* heart, *the* duodenum, et cetera, it is very necessary to recognize that these are abstractions and generalizations based, mainly, on studies on highly standardized experimental animals. As far as man is concerned, there is not merely *the* human adrenal but Harry's, Jane's, Robert's, and Mary's adrenal, and Harry's *(et al.)* adrenal when an infant, a child, a young adult, a middle-aged adult, a septuagenarian. It is in the differences—their nature, their quantity, their origins, their consequences—that we should begin to look for differences in health, in resistance, in susceptibility, adaptability, longevity—for the factors that make the difference between success and failure as a human organism. In short, we need to begin to study the function of any given part and the integration of the parts not only as isolates but in particular human contexts.

2. The mechanisms, patterns, and pathways of interchange between those portions of the nervous system which are concerned with life in the external environment (sensory and motor) and that portion concerned with the internal environment (autonomic):

While the somatic and the autonomic functions of the nervous system have been subjects of study for many years, and while virtually every act and activity of the intact organism involves the simultaneous, coordinated, and integrated participation of both, there has been and still is remarkably little investigation of the interchange between them. As a result, much of the meaning of each is lost, and all of their unified meaning. It is interesting, however, that this area is under considerable investigation at the clinical level outside of osteopathic circles, and the evidence is accumulating rapidly that much of human disease is related to or the product of failure in somatic-autonomic integration. Nevertheless it remains a virgin field for fundamental study of mechanisms and processes.

3. The slow and long-term influences of nerve activity:

The immediate responses of various tissues and organs to volleys of impulses have been and continue to be intensively studied. However, despite the abundant clinical evidence that the responses and properties of tissues to sustained nerve activity (or sustained cessation of nerve activity) are profoundly altered with time, that pathologic adaptations occur, and despite the fact that these long-term responses are not usually predictable from, and are often contradictory to, the short-term effects, they are virtually unexplored. We identify a few of the subcategories under this heading.

a. The trophic function of peripheral nerves. While the existence of trophic influence is widely recognized, its nature receives little study.

b. The influence of the autonomic innervation, at various levels of activity and over protracted periods, on the functions of various organs and tissues, including the endocrine glands.

c. The long-term adaptations of the blood vessels, blood flow, drainage, et cetera, to sustained overactivity or underactivity of the autonomic innervation.

d. The adaptation of skeletal muscles to sustained tension, active and passive, and the long-term influences of altered activity of their autonomic innervation.

e. Influence of peripheral nerve activity, at various intensities and durations, on cellular function: formation of enzymes, metabolism, permeability, interchange with blood and interstitial fluid, growth, cell division, et cetera.

f. Cellular adaptations to long-term moderate or intermittent ischemia.

g. Study not only of the responses of organs and tissues to sustained stimulation (or inhibition) of their sympathetic or parasympathetic innervation, but the secondary alteration of the responses of these tissues to other influences, for example, nervous, hormonal, and chemical.

4. Nutrition, fluid exchanges, and circulation in nerves and nerve tissues; factors influencing them; effects of their disturbances on nerve function and on the tissues which they innervate.

5. All aspects of referred pain; the long-term responses of, and changes in, tissues of the reference zone; somaticovisceral and viscerosomatic reflexes.

6. Triggers and trigger phenomena.

7. Physiologic, pathologic, morphologic, and chemical bases for alteration in the texture of various tissues, such as are used in osteopathic diagnosis.

8. The physiology, pathology, and chemistry of the fascias and other connective tissues; the effects of alterations in their tensions and other physical and chemical properties on the functions, activities, circulation, drainage, et cetera of other tissues.

9. Spinal kinesiology; the study not only of vertebral motion but the patterns and mechanisms of integration of total spinal activity; the roles of individual muscles, their regulation and integration with others. The origins of and adaptations to postural and locomotor stress associated with the erect stance.

10. Proprioceptive activity; the reporting to the nervous system of the activity, tensions, positions, motions, and other circumstances in the musculoskeletal system and the somatic and autonomic responses to such reporting.

11. Altered functional and cellular states of muscle; contracture, fibrosis, et cetera, and their experimental alteration.

12. Neuroendocrine factors influencing resistance to and responses to infection.

13. Gross and microscopic examination, in autopsies, of the spinal column, the spinal cord and its membranes and blood vessels, paravertebral tissues, et cetera, in relation to clinical history. This represents a treasure of information which has hardly been tapped. A system of autopsy in which osteopathic questions can be asked and answered awaits development.

In identifying a few of the fields of investigation to which osteopathic principles have led us as physiologists, I have deliberately avoided explicit reference to the osteopathic lesion. It is not our purpose to disregard it, for it is intimately related to all of the categories of phenomena enumerated above, and many more. Accumulation of knowledge in those areas is essential to our understanding of the osteopathic lesion. Our objective is more precise definition of problems for investigation. The too commonly accepted premise that osteopathic research is research on "*the* osteopathic lesion" or on "the effects of the osteopathic lesion," et cetera has, I believe, been a serious deterrent to scientific progress in osteopathy. The first and one of the most difficult and important steps in any research is a clear statement of the problem, an unambiguous formulation of the question to be put to nature. To propose research on an entity represented by a label or a phrase which has, as previously emphasized, many varied, private meanings to persons within the profession and none to scientists outside the profession is a failure to state the problem. Even worse, the research is too often an effort to make "the osteopathic lesion" confirm or conform to a preconceived etiologic framework which distorts its very nature.

The elements of an adequate research program

It is obvious that the opportunities for osteopathic research are vast and potentially of tremendous significance to science, health, and society, as well as to the osteopathic profession. It is equally obvious that research activity and achievement under osteopathic auspices have been minute in contrast with these opportunities. As was stated in the introduction, through its achievements in clinical practice, legislation, public recognition, and education, the profession is now better prepared than ever to turn its attention and resources to this relatively neglected phase of its function.

I have tried over a protracted period to enumerate in some logical system the essential elements for raising osteopathic research activity to a level and a scale more nearly commensurate with the magnitude of the opportunities. Invariably, my lists have reduced themselves to one central and, indeed, the only truly indispensable element to which all others are contributory—personnel. This conclusion is in complete agreement with policies developed through many years by research foundations, granting agencies, the National Institutes of Health, and others: that investment should be made, not in projects, but in investigators—in providing them with the circumstances and the means to work in areas of their selection, in their way, and further to develop their skills and those of others.[23,24]

The Key Element.—

In my opinion, the osteopathic profession still needs to appreciate the full significance of the key element—qualified investigators. There is no question that a considerable amount of medical and some osteopathic research, much of it of great value, has been done and is done by persons primarily occupied in other functions, such as clinical practice, teaching, and administration; and this should always be encouraged. Nevertheless, the fact remains that the research areas opened by osteopathic theory and practice are of such nature and scope as to demand full-time (or nearly full-time) investigation by scientists to whom research is not merely an avocation or sideline to be dabbled in in one's spare time, but to whom research is a *way of life*—the *only* way of life—for which they studied and prepared for many years, and for which, throughout their professional lives, they are continually preparing. Research is no less a specialty than the practice of medicine or surgery or any other profession and, in many ways, is much more rigorous in its demands. It is foolish to assume that all one needs, besides equipment and supplies, in order to do creditable research is the decision to do it or to "stimulate" others to do it.

The proper activation of osteopathic research demands the recruitment of an adequate corps of such workers who, given adequate means and circumstances, would not only themselves undertake such research, but also would attract others, train others from within and without our student bodies, enrich and multiply the efforts of the part-time and clinical investigators, and who would vitalize our educational programs. There are no satisfactory substitutes in research for qualified researchers whatever the degrees they may have, whatever their formal training. Investigators such as my Kirksville colleagues, J. S. Denslow, P. E. Thomas, and H. M. Wright, and others in the osteopathic profession are testimony to the fact that osteopathic physicians to whom research has become a way of life and who have the innate ability and motivation can, with the assistance, guidance, and collaboration of professional scientists, themselves become well-qualified professional scientists.

How, then, attract and recruit such a corps of scientists? Why should a talented scientist, already established or likely to be established as a teacher and investigator in a university, medical school, or research institute, with his interests and aspirations well defined, even give consideration to employment at an osteopathic institution? Why should he expose himself to the hazards of discrimination which are products of still surviving prejudices and ignorance regarding osteopathy and the osteopathic profession? What kinds of advantages can be offered which will outweigh these undeniably serious deterrents?

There is only one answer. The profession must be able to define and offer him such opportunities to utilize his talents for human knowledge and for human welfare as are available nowhere else. From my own personal experience I can say with complete conviction that osteopathic education and research *can* abundantly offer such uniquely challenging, exciting, and gratifying opportunities. They need to be identified, made known, and implemented.

Identification of the Opportunities.—

1. These opportunities in osteopathic research and education are derived from, and inseparably related to, the special function of osteopathic medicine. The osteopathic profession must, therefore, in unequivocal terms, declare itself with respect to what it considers to be, and demonstrates to be, its special distinctive contribution to human health and welfare—to the meeting of today's and tomorrow's health problems—and what it intends to do towards continued development of this

potential. So occupied has the profession been in establishing itself that it appears to have forgotten, at least a little, the special purposes that it is to serve, the unique contribution it is to make—and of which it is the instrument. Just as a recognizably unique contribution is the only reason for the profession itself, so would it be the only reason for a scientist to affiliate himself with the osteopathic movement. That unique contribution must be carefully defined as the objective of the profession and all necessary steps taken towards its realization. One of the main objectives of the current preparations by the Kirksville College of Osteopathy and Surgery for its projected Decade of Purpose (1957-1967) is the clear and precise formulation of that contribution (as a guide to the re-ordering of its educational, research, and clinical program). This urgently needs to be done by the osteopathic profession as a whole.

2. As a corollary, the profession's leading physicians, scholars, teachers, and scientists must, with the help of scientists and others outside the profession, identify the areas of the biomedical sciences which osteopathic theory, practice, and research have shown to be of critical importance to the understanding of life and to the control of health and to be in need of exploration. Our own efforts in this direction, reviewed in an earlier section, need to be greatly extended, and to all the basic medical sciences.

Implementation of the Opportunities by the Profession.—

Having clearly identified its special function and the contribution it wishes to make, the profession must then wholeheartedly accept and commit itself to the idea that it can make that contribution—and therefore survive and continue its development—only by disclosing the necessary knowledge and understanding through greatly expanded research programs. It needs then to declare and demonstrate its intention to support in all necessary ways the exploration of areas related to its special contribution. This requires:

1. Formulation of appropriate policy in which research is established as a major front for the profession.

2. Recognition, and greatly increased support, of the decisive role of the osteopathic colleges, for it is in them that the bulk of the research will be conducted, it is to them that scientists would come, and it is in them that future investigators will be recruited and trained. It is in the colleges that the necessary circumstances need to be created. As will be shown these circumstances do not yet exist.

3. The development and sponsoring of programs for the recruitment and training of research workers.

4. The development and procurement of resources for carrying out the above. This must come from three sources:

a. The profession itself, through the assessment and allocation of larger funds specifically for research and development.

b. Diversion of funds, resources, and attention from peripheral functions and activities in which osteopathy's special contribution cannot be made to those in which it can be made.

c. Society, the public, government, foundations, et cetera.

Society, through its governmental agencies and through private and public philanthropic agencies and foundations, still does not contribute to the support of osteopathic medicine, osteopathic education, and osteopathic research in proportion to the benefits which it derives and can derive from them. Nor is there reason to expect that it will, until it has a far better comprehension than it now has of the social value of the cause which it is asked to support.

The public and its agencies are already presented with a plethora of opportunities to support endeavors in education, research, and clinical and preventive medicine which are demonstrably worthy, important to health and welfare, and hopeful or successful. Osteopathic medicine, education, and research can win their share of society's support only when the profession can demonstrate that important social and health needs and opportunities exist which are not being met and which the osteopathic profession, through its institutions and through its educational, research, and developmental programs, is uniquely qualified to meet—given the necessary support.

Thus, this endeavor, too—the quest for society's support—depends upon the clarity and the firmness with which the profession identifies and describes the distinctive contribution it aspires to make and upon the vision and resources it turns to its development.

Implementation of the Opportunities by the Colleges.—

While research work is carried out by individuals, the fact remains that, today, research is an activity of institutions. The work of the individual prospers to the degree that it is provided for, supported, and encouraged by the institution in which he works. For obvious reasons, it is to our educational institutions—our colleges—that we need to give our main attention. Only if research is an activity of our colleges can we hope to attract scientists to our faculties.

Our colleges have yet, through firm policy and program, to establish research as one of their *primary* functions, and then, with the counsel of qualified scientists, to make all possible provision for it. While it may be protested that the first and highest obligation of each night *is* the establishment and maintenance of the highest educational standards the fact remains that the "highest educational standards" are not achievable unless research is a basic activity of the college. The statement often made by administrators and department heads of osteopathic colleges, "We haven't time for research," must, by deliberate policy, be made as patently absurd as "We haven't time to conduct classes."

It is the spirit, the atmosphere, and the *habit* of inquiry which give life to programs of higher education. Without them a professional college conducts not so much an educational program as a training program. The profession it trains is less a learned profession than a profession of technicians. We must frankly face the fact that whatever advances the osteopathic colleges have, with the support of the profession, made in recent years—and they have been tremendous—such a spirit of inquiry, of scholarly tradition, does not yet pervade our college atmospheres.

Proud as we are, and have good reason to be, of the physicians our colleges produce, that physician is a better one who has lived and studied in an atmosphere of inquiry, who has at least observed the seeking and weighing of evidence, who has become aware of the unknowns and the questions in medical theory as well as the accepted, the assumed, and the established in medical practice, and who is aware of the steps that are taken and *can* be taken towards their solution and towards further development.

A closed book is never an exciting or edifying one, however decorative it may be on the shelf. We need frankly to examine how the uninquiring, often doctrinaire, presentation of osteopathic theory, giving it the

appearance of a closed book, is affecting osteopathic education, practice, and progress. The osteopathic concept must be seen as a "tool" rather than as a "creed." "What we need," as Bertrand Russell said, "is not the will to believe, but the wish to find out, which is the direct opposite." Osteopathy—and osteopathic education—must live on the frontiers, or not at all. The osteopathic concept must be seen, through our educational programs, as the young, living, growing, and exciting thing it is, instead of the tired old banality it so often appears. It must be presented as the endless field of exploration which it is and not merely as the product of past diggings which, like a mummy, needs to be preserved. Osteopathic education needs to be vitalized by faculty members who can lead the explorations, by scientists whose lives *are* lived on the frontiers.

Through our colleges, opportunities in research and for training for research careers must be created and made known to our student bodies. While it may be lamented that, according to a recent estimate,[25] only about two out of every 100 medical students eventually become investigators, how fortunate the osteopathic profession could feel if one investigator were recruited from each class of approximately 500 osteopathic physicians who graduate each year! Only the rare student has become aware of the rich opportunities in osteopathic research and of the gratification, excitement, and joys in research as a career. Unquestionably the most effective factor in attracting physicians-to-be to research and in preparing them for research and for academic careers is through contact with active researchers on their own campuses, as an intrinsic part of their professional education.

It was my good fortune to have joined an osteopathic college which not only had, by carefully formulated policy, made research one of its primary functions, not only had, to the limit of its resources, provided for it, and not only had been able to demonstrate its firm intent with past achievement, but which also was able to challenge and excite the interest of scientists with sound descriptions of the unlimited opportunities in osteopathic research and education. The college has, through the years, subjected its policies with respect to research to continual close scrutiny and revision. It has continually sought the resources for enlargement of its research potential and has felt as obligated to make its funds available for research as for teaching and clinical service. It has continually sought the means to attract more scientists and to create the circumstances most conducive to their productivity.

The college has long recognized that the requirements of the teacher-investigator, in comparison with those of the teacher, are, for the college, a great deal more exacting. This includes not only premium salaries and more elaborate facilities and equipment, but also supportive technical personnel. Even further, it has recognized that one of the scientist's greatest needs is for other scientists with whom to exchange ideas and skills and with whom to share teaching and other responsibilities. It has therefore encouraged each established investigator to surround himself with other investigators to the limit of available resources. Since there is nothing, in an institution, more attractive to a scientist than other scientists and recorded scientific achievement (though it is still very small), the recruitment of scientists has become progressively facilitated in recent years, and grant funds have become more ample.

Recognizing its responsibility to prepare, for society and for the profession, future investigators, as well as practitioners, the college has, also from its own funds, established a system of undergraduate fellowships. Under this system selected students are invited to take their studies towards the D.O. degree over an extended period—an additional 1, 2, or more years—during which they receive special training through participation in the teaching and research programs of departments of their choice and during which time they receive financial assistance from the college.

While, in recent years, this college has enjoyed the benefits of substantial research grants from the American Osteopathic Association, governmental agencies, and private foundations and individuals, it is not sufficiently recognized that the groundwork had been laid years in advance and continues ever to be laid through (1) the establishment of research as a primary function of the college; (2) the formulation, with the counsel of scientists and scientific agencies, of sound enabling and guiding policy which is in continual evolution; (3) large prior investment, from its own funds, in facilities, materiel, and personnel; (4) willingness and readiness to invest in each project amounts equal to, and usually larger than, the grants awarded to it; (5) willingness and readiness to support departmental staffs much larger and far more expensive than those required for teaching alone; and (6) the ability to create an academic climate in which research, development, and scholarship can prosper.

While achievements in research (as well as in other areas) have been far too small, and progress far too slow to satisfy either the administrators of the college or the investigators, while too few departments are engaged in research, and while many circumstances urgently required for greater achievements and progress have yet to be created, it has only been my purpose to emphasize that such progress as has been made and will be made is the product not of fortuitous circumstances but of policy and planning and of much sacrifice by the College as a whole.

Summary and conclusions

1. Rapidly growing acceptance and support of the osteopathic profession by public, governmental, educational, and granting agencies and others now make it possible for the profession to devote a great deal more of its attention and resources to a neglected phase of its function as a profession: exploration and development of its special contribution to human health and to the biologic and medical sciences.

2. The fulfillment of the distinctive function of the osteopathic school of medicine, the making of its special contribution—the only reason for its existence—depends on the accelerated accumulation of essential knowledge, understanding, and methodology in certain areas of the biologic and medical sciences.

3. The prevailing orientation of medicine today, and therefore of medical research, is such that there is relatively little interest in, or recognized need for, knowledge in these areas and little recognition of vital interrelations among those of the areas that *are* being investigated. As a result, exploration in these areas is neglected or fragmentary.

4. To the degree that the profession attaches importance and social value to its distinctive contribution to human health—and therefore to the degree that it can justify its existence as a profession—to that degree is it obligated to assume responsibility for exploration and development in these areas, in order that it may make that contribution.

5. The profession's greatest and most critical need, in the meeting of that responsibility, is for adequate numbers of talented, qualified, full-time investigator-teachers in all of the medical sciences—to conduct research, to help define the areas of investigation, to attract and challenge other scientists through their achievements in these areas, to train other investigators, and to vitalize our educational programs.

6. In order to win the interest and participation of qualified scientists, the profession must be able to offer such challenging opportunities to contribute to human health and to human knowledge as are available nowhere else. Osteopathic research *can* abundantly offer such uniquely challenging, exciting, and gratifying opportunities. They need to be identified, made known, and implemented.

7. In order to identify and define these opportunities:

a. The profession must unequivocally declare itself as to what it considers to be, and demonstrates to be, its special distinctive contribution to human health and welfare and as to what it intends to do towards its continued development. Just as a recognizably unique contribution is the only reason for the profession itself, so would it be the only reason for a scientist to affiliate himself with the osteopathic movement.

b. Areas of the biomedical sciences which osteopathic theory, practice, and research have shown to be of critical importance to the understanding of life and to the control of health, but which are in need of exploration, need to be identified. This can be done through examination and development, in terms of growing biological medical knowledge, of the implications of basic osteopathic principles. That is, through the collaboration of osteopathic physicians and scientists, the principles which guide osteopathic practice must be transformed into a body of working hypotheses to guide osteopathic research.

8. In order to implement the opportunities thus defined, the following steps must be taken by the profession as a whole:

a. It must wholeheartedly accept and commit itself to the idea that it can make its special contribution to society—and therefore survive and continue its development—only by disclosing the necessary knowledge through greatly expanded research programs.

b. The profession must then formulate and observe the necessary policies to establish research as a major front for the profession. For this purpose, as for others, it should utilize the best scientific and educational counsel which is available.

c. It must give all possible support to the osteopathic colleges in their decisive role in this endeavor.

d. The profession must begin to divert funds, resources, personnel, and effort from the absorbing, peripheral areas in which osteopathy's special contribution cannot be made to those central ones in which it can. It must very soon decide which are peripheral functions and which the central ones for which it was established. Certainly it can be said of *any* profession with a new idea and limited resources that for every dollar and every man-hour spent on following, that much less remains for leading, for bringing the idea to fruition. The osteopathic profession needs to determine the optimal ratio for itself and make the necessary adjustments.

e. Osteopathic medicine, osteopathic education, and osteopathic research must win their share of society's support. This can be accomplished when the profession can demonstrate that important social and health needs and opportunities exist which are *not* being met and which the osteopathic profession is uniquely qualified to meet—given the necessary support. Success depends upon the clarity and firmness with which the profession identifies and describes the distinctive contribution it aspires to make and upon the vision and resources it turns to its development.

9. It is through the osteopathic colleges and affiliated institutions that all of the above must find their expression, for it is in the colleges that the bulk of the research will be conducted; it is to them that scientists would come; and it is in them that future investigators will be recruited and trained. The osteopathic colleges are not yet ready for this role, and they must begin to prepare. This requires, first, that research be firmly established as a *primary* function of each college, as it is for other institutions of higher and professional education. Second, the necessary enabling and guiding policies must be formulated. "High educational standards," for which all the osteopathic colleges continually strive, are no longer achievable unless research is a basic function of the college. Osteopathic education urgently needs to be vitalized by a pervasive spirit and habit of inquiry.

10. In conclusion, at this stage of history, scientific progress in osteopathic medicine is the shortest and surest road to society's understanding, acceptance, and support of the osteopathic contribution to human health and welfare, and the *only* road to the making of that contribution.

References

1. Korr, I. M.: Emerging concept of osteopathic lesion. J. Am. Osteop. A. 48:127-138, Nov. 1948.
2. Korr, I. M., Thomas, P. E., and Wright, H. M.: Symposium on functional implications of segmental facilitation; research report. J. Am. Osteop. A. 54:265-282, Jan. 1955.
3. Wright, H. M.: Origins and manifestations of local vasomotor disturbances and their clinical significance. J. Am. Osteop. A. 56:217-224, Dec. 1956.
4. Thomas, P. E.: Neurovascular factors in disease. To be published.
5. Stieglitz, E. J.: A future for preventive medicine. The Commonwealth Fund, New York, 1945.
6. Galdston, I.: Meaning of social medicine. Harvard University Press, Cambridge, Mass., 1954.
7. Jensen, J.: Modern concepts in medicine. C. V. Mosby Co., St. Louis, 1953, pp. 17-25.
8. Pottenger, F. M.: Symptoms of visceral disease. Ed. 7. C. V. Mosby Co., St. Louis, 1953.
9. Wolff, H. G.: Stress and disease. Charles C Thomas, Springfield, Ill., 1953.
10. Brain, R.: Need for philosophy of medicine. Lancet 1:959-964, May 16, 1953.
11. Editorial: Failure of modern medicine. J. Am. Osteop. A. 55: 123-125, Oct. 1955.
12. Halliday, J. L.: Psychosocial medicine; study of sick society. W. W. Norton & Co., New York, 1948.
13. Seguin, C. A.: Concept of disease. Psychosom. Med. 8:252-257, July-Aug. 1946.
14. Selye, H.: Stress and disease. Science 122:625-631, Oct. 7, 1955.
15. Loewi, O.: Reflections on study of physiology. Ann. Rev. Physiol. 16:1-10, 1954.
16. Lape, E. E., ed.: Medical research; midcentury survey. Little, Brown and Co., Boston, 1955, pp. xxii-xxxii, 3-85, vol. 1; pp. 3-67, vol. 2.
17. Carlson, A. J., and Johnson, V.: Machinery of body. Ed. 4. University of Chicago Press, Chicago, 1953.
18. Tainter, M. L.: Medicine's golden age; triumph of experimental method. Trans. N. Y. Acad. Sc. 18:206-227, Jan. 1956.
19. Dubos, R. J.: Biochemical determinants of microbial disease. Harvard University Press, Cambridge, Mass., 1954.
20. Galdston, I., ed.: Beyond the germ theory. Health Education Council, New York, 1954.
21. Hinkle, L. E., Jr., and Plummer, N.: "Host factor" in human illness; occurrence of differences in general susceptibility to illness among group of adult men. Clin. Res. Proc. 2:102, April 1954.
22. Korr, I. M.: Biological basis for osteopathic concept. J. Osteop. 61:13-19, April 1954.
23. Allen, E. M., and Endicott, K. M.: Public Health Service research grants in biology. Bull. Am. Inst. Biol. Sc. 3:19-21, April 1953.
24. Endicott, K. M., and Allen, E. M.: Growth of medical research 1941-1953 and role of Public Health Service research grants. Science 118:337-343, Sept. 25, 1953.
25. Lape, E. E., ed.: *Op cit.*, ref. 16, p. 288, vol. 1.

The effect of progressively increased EXERCISE on HEART SIZE

PHILIP J. RASCH, Ph.D.*
and
FREDERICK KRIEGER, B.A.
Research Center
Los Angeles County Osteopathic Hospital
Los Angeles, California

THE EFFECT OF VIGOROUS exercise on the size of the heart is a matter of great interest to physicians concerned with the problems of rehabilitation, sports medicine, physiology of work, and kindred subjects. Unfortunately, a survey of the literature pertaining to the effect of strenuous physical activity on the size of the human heart leaves the reader bewildered by a mass of conflicting data. He is told that years of vigorous effort do not produce cardiac hypertrophy;[1-4] that they produce physiologic hypertrophy;[5-7] that they cause physiologic hypertrophy which disappears when the need ceases;[8,9] that the undamaged heart does not hypertrophy but that the impaired one may;[10] that hypertrophy may be regarded as evidence of a pathologic condition in the cardiovascular system, or in some other system with cardiovascular repercussions;[11] that the heart of the athlete may be considered hypertrophied if judged by normal standards, but that normal standards cannot be applied to such individuals;[12] that approximately 10 per cent of all athletes have enlarged hearts but that there is no relationship between the size of the heart and athletic prowess;[13] that perhaps athletes are superior in performance because they are fortunate enough to have been born with large hearts.[5,11] (The last opinion is supported by Herrmann's[14] observation that thoroughbred race horses have larger than average hearts at birth. He also reported cardiac hypertrophy in response to training.) To complete the circle, the reader is informed that exercise may cause diminution in heart size.[15]

Since, in a study of this type, accurate data can be obtained only if the heart is actually weighed and measured, it may be assumed that definite information has been obtained through animal studies, but here, too, the data reported in the literature are conflicting. It has been stated by some investigators that the ventricles of the hearts of rats exercised by swimming for ½ hour daily were found to be significantly hypertrophied;[16] others have reported that there was only moderate cardiac hypertrophy in rats exercised by swimming for 3.3 hours daily.[17] In one study, significant changes were observed in the hearts of female rats but not in those of male rats;[18] in another study an increase in the weight of the heart was found in a few male rats only.[19]

The evidence suggests that the response of the heart to exercise may be affected by such factors as the type of exercise, the amount of exercise, and the sex and age of the subject; also that the results may be greatly affected by technics of measurement and the time at which such measurements are made. Parsonnet and Bernstein,[20] for instance, have discounted the value of many reports by insisting that the question of heart size immediately following exercise played no part in their discussion of cardiac strain, and Keys and Friedell[4] have offered specific criticisms of technics employed in earlier studies.

In most of the animal studies in which running was the selected form of exercise, the subjects in the experimental group were housed in an activity cage and permitted to exercise at their own volition and rate. However, nearly 40 years ago, Petrow and Siebert[21] emphasized that in the case of skeletal muscle hypertrophy results from increased intensity of work done (increase of work in a unit time), whereas the total amount of work done is of no significance. Whether this holds true in the case of cardiac muscle as well is not apparent from the literature.

Statement of the problem

It was the purpose of this study to investigate the effects of a work load progressively increased in intensity on the heart size of adult male rats.

Procedure

Fourteen adult (aged 9 to 12 months) albino rats of the University of Southern California strain were obtained. They were divided into a control group and an experimental group, each consisting of seven rats selected at random. Both groups were supplied with a standard diet of Purina Chow *ad libitum* with unlimited tap water. The control group was housed in small laboratory cages, which offered little opportunity for movement. The experimental group was trained to run in a motor-driven exercise drum. The total time of exercise was maintained at 30 minutes per day, and the intensity of the exercise per unit of time was increased weekly by increasing the speed of rotation of the drum. The rats were exercised 6 days a week. The weekly exercise records, including rates of running and distances per day and per week, are presented in Table I.

TABLE I—WEEKLY EXERCISE RECORD

Week	Rate (Meters/Min.)	Distance/Day (Meters)	Distance/Week (Meters)
1	4	120	720
2	8	240	1,440
3	14	420	2,520
4	20	600	3,600
5	22	660	3,960
6	25	750	4,500
7	28	840	5,050
Total			21,790

*Division of Research, College of Osteopathic Physicians and Surgeons, Los Angeles, California. Sponsored by William W. W. Pritchard, D.O., Coordinator of Research and Consultant in the Department of Physical Medicine and Rehabilitation, Los Angeles County Osteopathic Hospital.

TABLE II—MEAN CHANGES IN BODY WEIGHT (IN GRAMS)

Experimental Group		Control Group			
Before Exercise	After Exercise	Pre-experiment	Post-experiment	Difference	Degree of Significance
335.14		328.14		7.00	No significance
335.14	354.0			18.86	Significant
		328.14	**352.4**	**24.30**	Very significant
	354.0		352.4	1.60	No significance

TABLE III—MEAN CHANGES IN HEART MEASUREMENTS

Measurement	Experimental Group	Control Group	Difference	Degree of Significance
Weight	1.1038 gm.	1.0775 gm.	.0263 gm.	No significance
Longitudinal diameter	1.70 mm.	1.66 mm.	.04 mm.	No significance
Transverse diameter	1.21 mm.	1.19 mm.	.02 mm.	No significance
Ratio heart wgt/ body weight	0.003116	0.003057	0.000059	

Limitations in time made it necessary to restrict the exercise period to 7 weeks. Although there is evidence that the effects of exercise are cumulative over a much longer period, Hatai[22] and Donaldson[23] have indicated that the effect of exercise on rats is clearly shown within a period of 30 to 56 days. A period of 7 weeks in a rat's life is roughly equivalent to 210 weeks in a human's life.[24] At the conclusion of the exercise period the animals were weighed and sacrificed. To obviate any immediate effect of exercise, a period of 48 hours was allowed to elapse between the final exercise session and sacrificing. The hearts were then excised in a uniform manner and washed with saline solution. Transverse and longitudinal measurements were taken by means of a sliding caliper, following which the cavities were opened and washed free of clots. The heart was then dried on a piece of blotting paper and weighed. The data thus obtained were tested for significance by the use of Fisher's "t" technic.

Discussion

The mean body weights of the animals before and after the exercise period and the statistical significance of the observed changes occurring during that period are presented in Table II. It will be noted that there were no statistically significant differences between the weights of the animals in the experimental group and those in the control group before or after the exercise period although, on the average, the animals in the control group gained more weight during this period than did those in the experimental group. This supports Hatai's[22] opinion that body weight is not significantly affected by this type of exercise and Donaldson's[23] observation that in the male rat exercise does not stimulate body growth in terms of weight.

During the process of dissection, however, it was observed that the animals in the control group appeared to have a larger amount of fat in their bodies than did the subjects in the experimental group. There was a noticeable amount of fat around the hearts of the animals in the control group in contrast to those in the experimental group, which showed almost no fat around their hearts. It is possible that this difference may be of clinical importance.

The differences in the mean weights and longitudinal and transverse diameters of the hearts of the animals in the two groups and the statistical significance of these differences are shown in Table III. It will be noted that none of the observed differences are statistically significant, and it does not seem likely that the minute difference in the ratio of heart weight to body weight could be meaningful. Hatai,[22] on the other hand, observed an increase in the weights of the hearts of rats that had exercised voluntarily for 93 days. Since his animals at the age of 1 month were placed in an exercise cage where they spent their lives, they actually ran a much greater total distance than did the subjects in this experiment. This may account for the difference in results.

Summary and conclusions

An experimental group of male rats was given exercise of progressively increasing intensity for a period of 7 weeks; a control group was confined to cages which afforded little opportunity for movement.

At the end of the exercise period, both groups of animals were sacrificed and their hearts excised. There were no significant differences in body weight, heart weight, longitudinal and transverse diameters of the heart, or ratio of heart weight to body weight.

It was observed that there was a greater proportion of fat in the bodies, notably around the hearts, of the control animals.

Within the limitations of this study no evidence was found to indicate that progressively increased exercise produced cardiac hypertrophy.

References

1. Gordon, B.: Effect of effort on size of heart; observations on animals and marathon runners. Am. J. Roentgenol. 14:424-426, Nov. 1925.

2. Smith, H. L.: "Athletic heart," an unfortunate term. Proc. Staff Meet., Mayo Clin. 10:122-123, Feb. 20, 1935.

3. Eyster, J. A. E.: Further studies in cardiac hypertrophy. Am. J. Physiol. 93:647, June 1930.

4. Keys, A., and Friedell, H. L.: Size and stroke of heart in young men in relation to athletic activity. Science 88:456-458, Nov. 11, 1938.

5. Bramwell, C., and Ellis, R.: Some observations on circulatory mechanism in Marathon runners. Quart. J. Med. 24:329-346, April 1931.
6. Tung, C. L., *et al.*: Hearts of ricksha pullers; study of effect of chronic exertion on cardiovascular system. Am. Heart J. 10:79-100, Oct. 1934.
7. Krestovnikov, A. N.: Studies in physiology of physical exercise. State Publishing House, 1951.
8. Dedichen, L.: Influence of physical effort on heart. Acta med. Scandinav. 53:738, Jan. 1921.
9. Roesler, H.: Roentgenological study of heart size in athletes. Am. J. Roentgenol. 36:849-853, Dec. 1936.
10. Stine, D. G.: Meaning of "athletic heart" among university athletes. Journal-Lancet 58:405-415, Sept. 1938.
11. Abrahams, A.: Exercise and cardiac hypertrophy. Lancet 2:565-566, Oct. 19, 1946.
12. Deutsch, F., and Faul, E.: Heart and athletics. C. V. Mosby Co., St. Louis, 1927.
13. Stine, D. G.: Method of testing cardiac function. Ann. Int. Med. 13:807-825, Nov. 1939.
14. Herrmann, G.: Heart of thoroughbred race horse; studies in hypertrophy. Proc. Soc. Exper. Biol. & Med. 26:549-551, 1929.
15. Cureton, T. K.: Shrinkage of heart size associated with improved cardiovascular condition due to progressive physical training of three middle aged men. J. A. Phys. & Ment. Rehabil. 10:75-78, May-June 1956.
16. Hearn, G. R., and Wainio, W. W.: Succinic dehydrogenase activity of heart and skeletal muscle of exercised rats. Am. J. Physiol. 185:348-350, May 1956.
17. Shelley, W. B., Code, C. F., and Visscher, M. B.: Influence of thyroid dinitrophenol and swimming on glycogen and phosphocreatine level of rat heart in relation to cardiac hypertrophy. Am. J. Physiol. 138:652-658, March 1943.
18. McClintock, J. T., Hines, H. M., and Jordan, D. P.: Effects of activity upon tissues of rat. Proc. Soc. Exper. Biol. & Med. 42:139-142, Oct. 1939.
19. Knoll, W., and Fronius, H.: Trainingsversuche an ratten. Biol. Abst. 8:13551, June-July 1934.
20. Parsonnet, A. E., and Bernstein, A.: Heart strain; critical review; development of physiologic concept. Ann. Int. Med. 16:1123-1136, June 1942.
21. Petrow, H., and Siebert, W.: Cited by Steinhaus, A. H.: Strength from Morpurgo to Muller—half century of research. J. A. Phys. & Ment. Rehabil. 9:147-150, Sept.-Oct. 1955.
22. Hatai, S.: On influence of exercise on growth of organs in albino rat. Anat. Rec. 9:647-655, 1915.
23. Donaldson, H. H.: On effects of exercise carried through 7 generations on weight of musculature and on composition and weight of several organs of albino rat. Am. J. Anat. 50:359-396, July 1932.
24. Donaldson, H. H.: The rat. Memoirs of Wistar Institute of Anatomy and Biology, no. 6, Philadelphia, 1915.

Cardiac ARRHYTHMIAS during surgical ANESTHESIA*

NORMAN CASSETT, A.B., D.O.†
Philadelphia, Pennsylvania

(Continued from the December JOURNAL*)*

Certain Drugs.—

Curariform Agents:

These drugs are muscle relaxants by virtue of their ability to interpose a block between acetylcholine and the effector cell at the myoneural junction.[25] Their usefulness in anesthesia derives solely from this property and from the order of skeletal muscle paralysis induced. The muscles of the head and neck are first affected, then the muscles of the extremities, followed by the abdominal musculature, and finally the muscles of respiration. The intercostal muscles are paralyzed before those of the diaphragm.[27]

The curariform drugs have considerably broadened the scope of anesthesia. By their use adequate muscular relaxation can be obtained with minimal amounts of the general anesthetic agents. Considerable skill is required, however, to use these drugs safely and effectively. They have absolutely no analgesic or hypnotic properties, and their action mimics the signs of anesthesia. Consequently, great care must be taken to accomplish analgesia and unconsciousness before injecting curariform agents and to maintain the intended depth of anesthesia. Sudden paralysis may be very alarming to a conscious patient, and surgical trauma can precipitate dangerous cardiac reflexes in a patient who is too lightly anesthetized.[22]

Because of the narrow margin between desirable muscular relaxation and complete paralysis of the diaphragm,[25] asphyxiation must constantly be guarded against. Use of the curariform agents requires thorough familiarity with resuscitative procedures such as endotracheal intubation and artificial respiration with positive pressure.

It is apparently common anesthetic practice to use Pentothal and curare to facilitate endotracheal intubation. The patient is first rendered unconscious with the intravenous barbiturate, then, to provide relaxation and abolish the laryngeal reflex, a curariform drug is injected until near, or actual, apnea occurs. With concomitant use of a potent central respiratory depressant and an agent which paralyzes the muscles of respiration, intubation must be accomplished with dexterity and rapidity to avoid asphyxia. Figure 4 graphically illustrates what may happen if things do not go well during this procedure.

Procaine: Intravenous procaine is sometimes used as an adjunct to inhalation anesthesia and for the relief of pain. In addition, its powerfully depressant action upon the myocardium has been found of value in the control of ventricular arrhythmias. It depresses vagal activity, myocardial excitability, and the tendency for spontaneous rhythmicity of ectopic cardiac pacemakers.[10] These are the properties that make procaine valuable in the treatment of arrhythmias. Unfortunately, nodal tissue and normal conduction pathways are also depressed so that large doses of procaine may precipitate dangerous arrhythmias instead of curing them. There are certain precautions that must be taken. Overdosage can cause severe bradycardia and cardiac arrest. These same general statements apply to the other antifibrillatory drugs—quinidine and procaine amide (Pronestyl). More will be said about these agents in the section entitled Treatment.

Epinephrine:

The action of epinephrine upon the myocardium consists essentially of cardioacceleration through the sinoatrial node, increased force of ventricular contraction, and altered rhythmic function of the ventricles.[29]

*This thesis was submitted in partial fulfillment of requirements for the degree Master of Science granted by the Philadelphia College of Osteopathy, Philadelphia, Pennsylvania, 1956.

†Resident in Internal Medicine, Hospitals of the Philadelphia College of Osteopathy, 1953-1955. Senior Teaching Fellow, National Heart Institute Cardiovascular Training Grant Program, Philadelphia College of Osteopathy, 1955-1956.

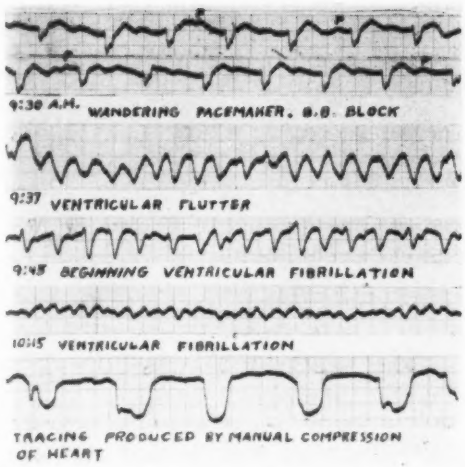

9:30 A.M. WANDERING PACEMAKER, S-A BLOCK
9:37 VENTRICULAR FLUTTER
9:45 BEGINNING VENTRICULAR FIBRILLATION
10:15 VENTRICULAR FIBRILLATION
TRACING PRODUCED BY MANUAL COMPRESSION OF HEART

Fig. 4. Sequence of electrocardiographic changes leading to ventricular fibrillation in a fatal case of cardiac arrest. The patient was a 52-year-old female with a history suggestive of coronary heart disease. Proposed surgery: cholecystectomy. Spinal analgesia was started at 7:45 a.m. Blood pressure dropped from 178/100 to 100/70; 5 cc. of Eschatin intravenously raised the blood pressure to 120/76; 300 mg. of Pentothal sodium intravenously were then administered. At 8:05 a.m., Anectine, 20 mg. intravenously given, and endotracheal intubation started. Laryngeal relaxation was inadequate; 200 mg. more of sodium Pentothal were given. Continued attempts to intubate the patient proved unsuccessful. At 8:14 a.m. there was no palpable pulse. Oxygen was forced and artificial respiration started. There was no response. Left thoracotomy was performed at 8:16 a.m. The heart was in standstill. Cardiac massage was begun and continued until 11:45 a.m. at which time rupture of the heart occurred at the left atrioventricular junction. (Alarming degrees of hypoxia and hypercapnia have been shown to occur during prolonged, difficult endotracheal intubations.)

Its use during anesthesia should probably be restricted to direct intracardiac injection of the exposed heart in ventricular asystole of cardiac arrest. Epinephrine is known to precipitate ventricular arrhythmias with all types of general anesthetic agents and is positively contraindicated during anesthesia with chloroform, cyclopropane, or ethyl chloride.[25]

A tendency exists to administer epinephrine or other sympathomimetic drugs for the precipitous drop in blood pressure that frequently occurs following the development of ectopic cardiac rhythms. This may be hazardous since it will probably not alter the arrhythmia but may induce ventricular fibrillation.[10] Again, the need for electrocardiography during general anesthesia is indicated.

The Plane of Anesthesia.—

In the prophylaxis of serious cardiac arrhythmias and cardiac arrest, textbooks advise against either "too light" or "too deep" anesthesia.[22,25] Opinions vary, however, regarding the relative frequency of arrhythmias in the various planes of anesthesia. One authority[7] remarks upon the high incidence of arrhythmias during light anesthesia; another[10] states that ectopic rhythms usually occur under deep anesthesia. The danger of too deep anesthesia is medullary paralysis with respiratory and vasomotor collapse. The hazard of too light anesthesia lies in the stimulation of dangerous reflexes that have not yet been abolished. The phrase "too light," however, is not absolute, but relative to the operative procedure being performed. An anesthetic level adequate for one surgical manipulation may be too light for another.

Most anesthetic deaths apparently occur in the second stage of anesthesia.[25] This is the excitement stage, in which consciousness is lost, but there is uninhibited action of the patient. Periods of apnea may alternate with deep rapid respirations so that administration of the anesthetic is difficult to control, and overdosage may occur from sudden high blood concentrations. Operative procedures in this stage are to be strictly avoided since dangerous cardiac and respiratory reflexes may be excited.

So far as disorders of cardiac rate and rhythm are concerned, the important thing is that they can happen during any of the stages of anesthesia. As a matter of fact, it is doubtful that their general incidence is any higher during one plane than in another. In a study of electrocardiographic tracings during 113 surgical operations under various anesthetic agents including chloroform, cyclopropane, ether, ethylene, nitrous oxide, and tribromoethanol, Kurtz, Bennett, and Shapiro[8] could establish no constant and specific relationship between the occurrence of arrhythmias and the depth of anesthesia. Arrhythmias were common during all degrees of anesthesia. Even when the depth was increased to the level of respiratory arrest, no greater electrocardiographic disturbances occurred than were noted in the upper planes.

The Operative Procedure.—

The role played by the operative procedure in the production of cardiac arrhythmias involves consideration of the reflexes initiated by manipulation of the patient's viscera and other tissues. Reflex effects resulting in all sorts of arrhythmias, and even cardiac arrest, have been attributed to operations on the pericardium and heart, manipulations near the hilus of the lung, stimulation of the trachea, and traction on the appendix, gallbladder, or other viscera.

Jaruszewski, Hellerstein, and Feil[7] noted frequent disturbances of the rhythm of the heart during certain phases of cardiac surgical procedures. These included dissection in proximity to the vagi, incision of the pleura, retraction of the ribs, dissection of the hilar vessels, and packing away of the lungs. These procedures were often accompanied by sudden bradycardia, hypotension, and displacement of the pacemaker or ventricular premature beats. Significantly, the situation in each instance was corrected by administration of atropine and reinflation of the lungs.

There is little doubt that stimulation of the vagus nerve can inhibit the normal cardiac pacemaker, slow the rate of the heart, and encourage escape mechanisms which establish abnormal rhythms. Whether there is any definite relationship, however, between the occurrence of arrhythmias and the steps of the surgical procedure, uninfluenced by other variable factors (of which there are a multitude during surgical anesthesia), is open to serious question.

Maher, Crittenden, and Shapiro[6] studied viscerocardiac reflexes electrocardiographically during eighty-nine cases of various types of major operations. There was a very high incidence of arrhythmias, but they could find no constant or specific relationship between the surgical procedure and the cardiac response. In some cases, cardiac irregularities apparently appeared in direct association with visceral stimulation. Bradycardia, upon pulling of the gallbladder, was particularly suggestive of such a relationship. Yet even in these cases, when the surgeon was asked during the same operation, or a similar operation, to repeat the specific procedure with special emphasis intended to elicit the cardiac response, almost always, nothing happened. Others[3] who have studied a large number of cases report similar findings.

Operative manipulations, whether abdominal or thoracic, cannot help but be associated with varying degrees of vagal stimulation. It is probable, however, that the degree of cardiac inhibition induced under

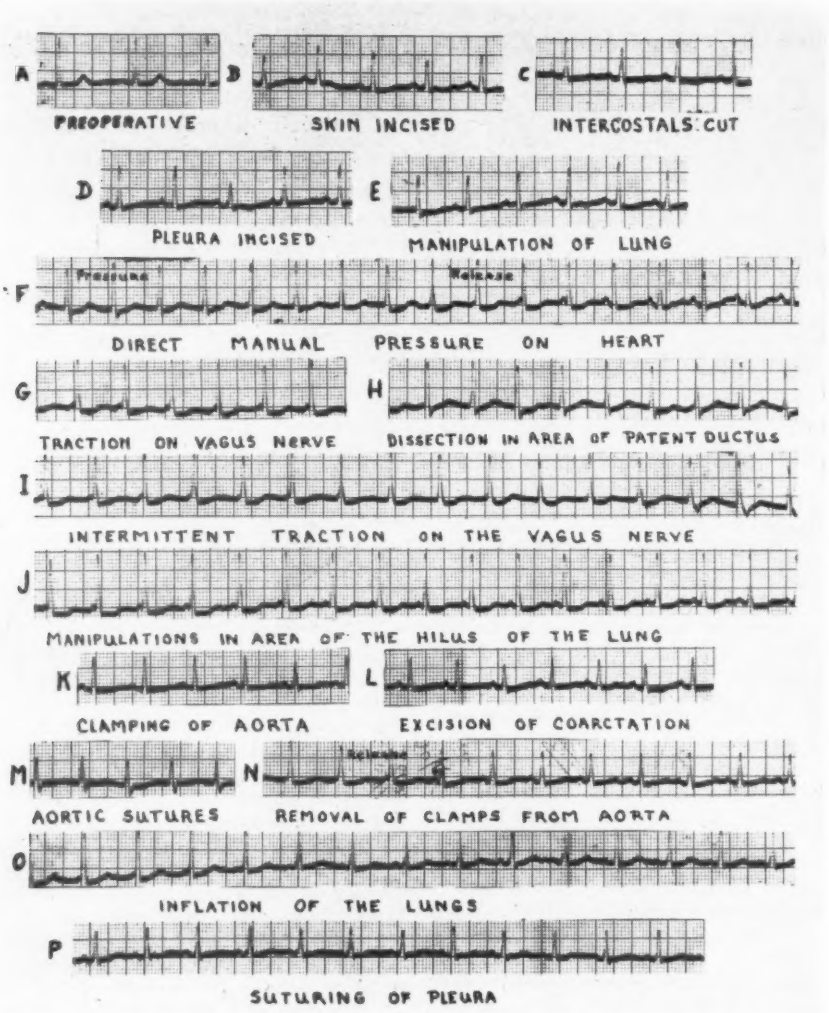


Fig. 5. Minor cardiac irregularities during course of operations for excision of coarctation of the aorta. A ductus arteriosus, with a minute patent lumen, was also present and excised. The patient was a 17-year-old female. The preoperative electrocardiogram was normal. (All tracings are lead II.) A continuous tracing of the electrocardiogram was observed on the cardioscope screen throughout the surgical procedure. No serious arrhythmias were encountered. Manual pressure on the heart (F) and direct traction on the vagus nerve, both sustained (G) and intermittent (I), produced only a transient shift of the pacemaker from the sinoatrial node to various parts of the atrioventricular node. This arrhythmia was present sporadically throughout the period of anesthesia, as was also an intermittent deviation of the S-T segment and flattening of the T waves. Significantly, inflation of the lungs (O) restored sinus rhythm.

usual circumstances is relatively innocuous (Fig. 5). Morton and his associates[30] studied the cardiac effects of intrathoracic vagal stimulation on thirty patients by means of electrocardiograms. All of these patients were found to have inoperable bronchogenic carcinoma at the time of exploratory thoracotomy, and, as a palliative measure, the homolateral vagus nerve was transected below the origin of the recurrent laryngeal nerve. Electrocardiographic tracings were taken during traction on the vagus nerve, crushing of the vagus nerve, transection of the vagus nerve and, in twelve cases, during deliberate electrical stimulation of the intact vagus as well as the proximal and distal ends of the transected nerve. Surprisingly enough, only two patients evidenced cardiac changes due to vagal stimulation. The changes occurred following application of the electric current and were transient and of a minor nature.

These findings suggest that vagovagal reflexes alone are not so important as previously supposed in the production of serious cardiac arrhythmias and cardiac arrest during anesthesia.

The Patient.—

The patient himself must, of course be considered in evaluating the causes of arrhythmias during anesthesia and surgery. Premature beats present preoperatively are very likely to be harbingers of ectopic rhythms.[7] Diseased hearts are particularly susceptible. In the series of Eisaman and his coworkers[26] the highest incidence of arrhythmias occurred in cases of cardiovascular disease.

The occurrence of cardiac irregularities under anesthesia may be anticipated in patients with atrioventricular heart block, bundle branch block, Wolff-Parkinson-White syndrome, structural heart disease of any type, or a past history of episodes of paroxysmal tachycardia or other ectopic rhythms.[10]

The damaged heart is usually more sensitive to oxygen lack than the normal. Friedberg[31] cautions against hypoxia, particularly in patients with advanced

coronary arteriosclerosis, syphilitic coronary ostial stenosis, aortic stenosis, or Adams-Stokes syndrome. The tendency toward sudden death, already present in these people, is accentuated by factors impairing myocardial oxygenation and coronary blood flow.

Metabolic and endocrine disturbances, particularly in association with diabetes mellitus and thyroid and adrenal disorders, are important to consider. Diabetic acidosis will, like acidosis of any type, augment vagal inhibition and predispose to cardiac arrhythmias.[19] In controlled diabetics, insulin on the day of surgery should probably be avoided to avert hypoglycemic shock. By the same token, patients subject to hypoglycemic episodes, either functional or organic, should be adequately fortified with glucose, both preoperatively and during surgery. Characteristic tachycardia is associated with hyperthyroidism, and ectopic rhythms are frequent. Conversely, in hypothyroidism, bradycardia is often present. It is desirable, when possible, to normalize the basal metabolic rate preoperatively. The adrenal cortex also plays an important role in cardiovascular function. Adrenal cortical insufficiency will, under the stress of surgery, predispose to shock. It is wise prophylaxis to administer cortisone or a similar adrenal steroid before, during, and after surgery to patients with even subclinical manifestations of this disorder. The same is true for those who have received prolonged adrenal cortical steroid therapy at any time.

Fluid and electrolyte disturbances may be associated with an increased tendency to develop cardiac irregularities. Dehydration, for example, is commonly associated with acidosis. Balanced concentrations of calcium, potassium, and sodium are absolutely essential to normal cardiac function. It is the presence of these cations in proper proportion that ensures the rhythmicity of cardiac contractions.[20] Every effort should be made preoperatively to correct abnormalities of fluid and electrolyte balance.

Morbid conditions such as congestive heart failure and shock must obviously be corrected preoperatively since they enormously increase the operative risk. Anemia, also, from hemorrhage or any other cause, increases the work of the heart, results in myocardial anoxia, and should be corrected by transfusion, if necessary, before surgery is attempted.

The Anesthetist.—

During anesthesia, the responsibility for control of the patient's vital functions rests upon the anesthetist. This is no mean assignment. Modern anesthesiology has a rich armamentarium of potent drugs, gases, and volatile liquids at its disposal. Anesthetic procedures have kept pace with surgical advancement and have become considerably diversified. This represents progress, and there is no argument on this score. The expanding list of anesthetic agents and technics, however, has tremendously increased the lethal possibilities of anesthesia. There are those who decry the use of multiple anesthetic agents as a dangerous trend. Certainly, in the hands of the poorly trained, the inept, or the unqualified, this may be true. Multiplicity of anesthetic agents is the prerogative of the highly skilled and experienced anesthesiologist who, if he feels circumstances so warrant, may judiciously and with balanced precision and finesse, use many different anesthetic agents and drugs on one patient, with an over-all effect that is beneficial and not harmful.

Between anesthesiologists of high caliber and those who are merely technicians lies a large group with varying levels of ability. The same is true of any vocation. A man should know his limitations. To work within those limitations is the better part of caution. It is no disgrace to be conservative.

The Surgeon.—

Any general surgical procedure involves physical injury to the patient. Tissues and organs are cut, pulled, and crushed; blood is shed; and the internal parts of the body, normally hidden in their protective cavities, are exposed to the atmosphere. All this, of course, is necessary. The good surgeon, however, has respect for tissue; he handles it gently and avoids undue trauma; he insures adequate hemostasis to avert shock and tissue anoxia; and, with good judgment, he limits his surgery to what is necessary. For the cardiac patient in particular, the operation should be so planned that it is the simplest one which will do the job in the shortest time and with the least risk to the patient.

The surgeon should be cognizant and respectful of the responsibility of the anesthetist. Those who walk around the operating room hurrying the anesthetist into quick inductions, so that they may get to the next case, are not respectful of the anesthetist's responsibility; neither are those who jeopardize the life of the patient by continually "pushing" the anesthetist to obtain optimum operating conditions. The very quiet operative field, so revered by surgeons, may sometimes be obtained at the expense of considerable hypoxia and hypercapnia.

The Clinician.—

The internist is often called upon to evaluate patients as surgical risks and to assist in the preoperative and postoperative management of problem cases. In evaluating a patient as a surgical risk, the clinician must consider, not only the patient, but also the abilities of the surgeon and anesthetist and the facilities available. In his consultation he is expected to include his findings, impressions, and suggestions regarding management. It is not his duty, nor is it his right, to recommend specific anesthetic agents or technics. Any competent anesthesiologist will resent such encroachment upon his prerogative. On the other hand, if the anesthetist has limited training or ability, the internist may unwittingly force him into an unfamiliar procedure which, though theoretically preferable, may fail and do much harm to the patient. Any qualms in the mind of the clinician should be resolved by discussion and conference and not by imperious dictation on the consultation sheet.

In the preoperative management of a patient, the duty of the internist involves correction, within the limits of the time available, of any alterations in physiologic function that increase the risk of surgery.

Prevention

The principles of prevention of serious cardiac irregularities during surgical anesthesia have already been implied or stated directly in other parts of this thesis. First and foremost, an adequate airway must be assured the patient at all times. The hazards of hypoxia and carbon dioxide accumulation have been repeatedly stressed and are undoubtedly of major importance. Every effort must be made to provide adequate oxygenation and remove carbon dioxide. It has been mentioned that the portable (ear) oximeter is a valuable aid in the detection of early hypoxia, and its routine use in the operating room is recommended.

Adequate preparation of the patient prior to surgery is extremely important. This includes correction of fluid and electrolyte imbalance, transfusions in anemia, treatment of heart failure and shock, and other

prophylactic measures previously described for specific conditions. The finger of suspicion is pointed at patients with structural heart disease or a history of arrhythmias. Bellet[10] believes that patients with a history of ectopic rhythms or Wolff-Parkinson-White syndrome should, according to the nature of the arrhythmia, receive prophylactic digitalis, quinidine, or Pronestyl. Beck's group advises preoperative digitalization of all patients with atrial flutter or fibrillation in order to prevent the necessity of digitalization during the operative procedure.[7] Bonica[2] cautions against the use of preoperative digitalis except for the treatment of heart failure and atrial fibrillation or flutter with ventricular rates above 100 per minute. He believes that the use of digitalis as prophylaxis against possible heart failure is not only inefficient, but may enhance harmful reflexes, precipitate atrial fibrillation, heart block, or premature contractions, and may interfere with emergency administration of intravenous digitalis or strophanthin during the operation, if this should become necessary.

In patients with angina pectoris, frequent sublingual administration of nitroglycerin preoperatively may be beneficial.[31] Aminophylline has been advocated because of its effect in increasing coronary blood flow. However, it also increases cardiac work and thus nullifies the first theoretical advantage.[2] Papavarine, 30 to 60 mg. given parenterally 15 to 30 minutes preoperatively, may be of some prophylactic value.[2,31]

Concerning anesthetic agents and drugs, certain generalities are of particular importance:

1. A multiplicity of preanesthetic and anesthetic drugs may be hazardous. Not only may synergisms occur which are little understood, but respiratory depression can predispose to hypoxia and hypercapnia. This does not mean, however, that any particular procedure should be demanded of a competent anesthetist.

2. Too rapid induction of anesthesia, actually amounting to overdosage,[1] predisposes to cardiac arrest.

3. Chloroform, ethyl chloride, and trichloroethylene are contraindicated in patients with cardiac disease and in those with preoperative cardiac arrhythmias. Cyclopropane is best avoided in these patients unless the anesthesiologist is very experienced in administration of cyclopropane anesthesia.

4. At least 50 per cent oxygen should be used with thiopental sodium anesthesia.[1]

5. High spinal anesthesia should be avoided in patients with severe hypertension, arteriosclerotic heart disease, or anemia due to blood loss; it is contraindicated in shock.

6. Epinephrine is best avoided in all cardiac patients. It is definitely contraindicated during anesthesia with cyclopropane, chloroform, or ethyl chloride.

7. Atropine protects the heart from reflexes instituted through the vagus nerve. Preoperatively, and at intervals during surgery when bradycardia occurs, it is a valuable prophylactic aid against arrhythmias and cardiac arrest.

Treatment

Serious ventricular arrhythmias, especially ventricular tachycardia, demand immediate treatment and conversion to normal rhythm if at all possible. Specific therapy, however, requires first an accurate diagnosis. In many cases this may be impossible without electrocardiographic aid. Under these conditions, it is better to avoid digitalis, for it is likely to prove fatal if the arrhythmia should be ventricular tachycardia. Multiple ventricular premature systoles may also be worsened by digitalis. On the other hand, the intravenous route, often necessary for effective treatment under emergency conditions of anesthesia, is potentially dangerous with procaine, procaine amide, or quinidine and really should not be used without electrocardiographic control. A dilemma is thus created. Vigorous treatment may be required to eradicate some of the serious cardiac arrhythmias during anesthesia, yet these arrhythmias frequently cannot be diagnosed or specifically treated without the aid of electrocardiography. Furthermore, most of the irregularities arising from ectopic foci in the myocardium are not even discovered by palpation during anesthesia. Only 6.5 per cent are detected by this method.[2] The solution to this problem is obvious. There is a definite place in the practice of anesthesiology for the electrocardiograph.

Orth[8] believes that adequate ventilation of the patient to provide oxygen and remove carbon dioxide will suffice in most cases not only to prevent cardiac arrhythmias, but to abolish them once they have occurred during the course of anesthesia. This is probably true and may avert the necessity for some of the more vigorous procedures described below. No drug will compensate for oxygen lack.

Supraventricular Arrhythmias.—

Premature Systoles: Atrial or atrioventricular nodal premature beats are relatively innocuous and usually require no therapy. Occasionally they may occur with great frequency and be precursors of supraventricular tachycardias. In such cases intravenous drip of 0.1 per cent procaine or Pronestyl will usually prove effective.

Supraventricular Tachycardias (sinus tachycardia, atrial tachycardia, atrial flutter, atrial fibrillation, atrioventricular nodal tachycardia):

Sinus tachycardia occurring during surgery is usually the result of hemorrhage, shock, hypoxia, or overdosage with sympathomimetic drugs. Treatment is that of the causative factor. Digitalis will not alleviate sinus tachycardia in the absence of heart failure unless toxic doses are given. Quinidine and procaine are also ineffectual.

In the presence of the other supraventricular tachycardias mentioned above, intravenous digitalis in the form of Cedilanid or strophanthin is the safest and most reliable therapy.[10] Digitalizing doses are usually necessary. Electrocardiographic diagnosis is assumed, of course. If any doubt exists regarding differentiation of supraventricular from ventricular tachycardia, quinidine or procaine is a wiser choice, since digitalis in the presence of ventricular tachycardia may induce ventricular fibrillation. Carotid sinus pressure alone may prove effective for paroxysmal atrial tachycardia and obviate the necessity for drug therapy.

Sinus Bradycardia, Nodal Bradycardia, Atrioventricular Dissociation, Wandering Pacemaker: These arrhythmias, when they appear during anesthesia, are manifestations of increased vagal tonus. They are usually transient but, if persistent, can in most cases be readily abolished by atropine. Persistent bradycardia may be a sign of impending cardiac arrest and intravenous administration of atropine should be repeated in such cases as often as required. The cardiac protective effect of atropine is estimated to have a duration of 25 to 45 minutes when it is given intravenously.[1]

Ventricular Arrhythmias.—

Premature Systoles: Occasional ventricular premature beats require no therapy. However, when they

become multiple or multifocal, they constitute potential ventricular tachycardia or fibrillation and should be reduced in frequency or abolished if possible. Therapy during anesthesia is the same as for ventricular tachycardia and flutter as described below.

Ventricular Tachycardia and Ventricular Flutter: These disorders are immediate precursors of ventricular fibrillation and, if at all possible, demand rapid conversion to normal rhythm, or at least slowing of the ventricular rate, with quinidine, procaine, or procaine amide (Pronestyl).

The conditions of anesthesia, of course, preclude the oral route of administration, and the urgency of the situation very often necessitates the most hazardous route—intravenous. The potential danger in the intravenous use of these antifibrillatory drugs has already been alluded to in the discussion of Contributing Factors. Severe bradycardia and cardiac arrest can occur if close attention is not paid to the action of these drugs upon the heart. Nevertheless they are extremely valuable agents in the therapy of ventricular arrhythmias. In an electrocardiographic study of 113 patients under general anesthesia, Eiseman and his associates[26] used intravenous procaine only in the more alarming ventricular arrhythmias and found it 93 per cent effective in restoring regular rhythm in a total of twenty-nine patients.

Procaine is so rapidly hydrolyzed and so evanescent in effect that it can be used only intravenously. Both quinidine and Pronestyl may be given intramuscularly—quinidine as the gluconate, hydrochloride, or lactate, and Pronestyl as the hydrochloride or gluconate. An intramuscular dose of 0.6 gram of quinidine gluconate can be repeated at hourly intervals, if necessary.[10] For multiple ventricular premature systoles, this may be wiser than the more hazardous intravenous route. Likewise, Pronestyl may be given intramuscularly in a dosage of 0.5 to 1 gram. The initial effect by this route occurs within 5 minutes, with maximum effect in 30 to 60 minutes.

The immediate danger presented by ventricular tachycardia (or flutter) during anesthesia justifies intravenous use of the antifibrillatory agents. Electrocardiographic control is highly desirable with intramuscular administration, but it is practically a necessity when the intravenous route is used. Not only do these drugs suppress nodal activity and block conduction, but their hypotensive action caused by vasodilatation creates an additional hazard. This effect is most profound with intravenous Pronestyl.[10,32] Whichever antifibrillatory drug is used, the same general precautions apply: Intravenous injection should be slow and under electrocardiographic control. Administration should be stopped or slowed as soon as the rhythm returns to normal. If a conduction block (widening of QRS) over 50 per cent develops (as from 0.08 to 0.12 second) injection should be discontinued, at least until recovery occurs.[10,32]

There are several methods for intravenous administration of these agents. A relatively safe procedure is to add 5 cc. of 20 per cent procaine or 1 gram of Pronestyl to 500 or 1,000 cc. of isotonic saline or 5 per cent dextrose in water. This provides a 0.1 or 0.2 per cent solution. The rate of drip may then be adjusted as required; perhaps flowing freely at first until the rhythm of the heart is improved, and then discontinued, or slowed to 80 or 100 drops per minute as the situation may require.

Bellet[10] suggests an intravenous rate of administration of 0.3 to 0.8 gram over a 10-minute period for quinidine, and for Pronestyl, 100 mg. every 2 to 3 minutes until sinus rhythm is restored or until a total of 1 gram is given or toxic effects are noted on the electrocardiogram.

Di Palma[32] is more conservative, recommending that the rate of administration for either quinidine or Pronestyl not exceed 0.1 gram in a 15-minute period, with a total dose for quinidine of not more than 0.65 gram.

Ventricular Fibrillation and Cardiac Arrest: Ventricular fibrillation is a totally impotent cardiac rhythm unable to sustain any cardiac output. Sudden disappearance of the palpable pulse and blood pressure with absent heart sounds during anesthesia is a manifestation of either ventricular fibrillation or cardiac arrest. In either event, the therapeutic approach is the same. Thoracotomy should be performed immediately; temporization means failure. Adequate circulation and oxygen supply to the brain must be established within 3 to 5 minutes. Anoxia existing beyond this limit may

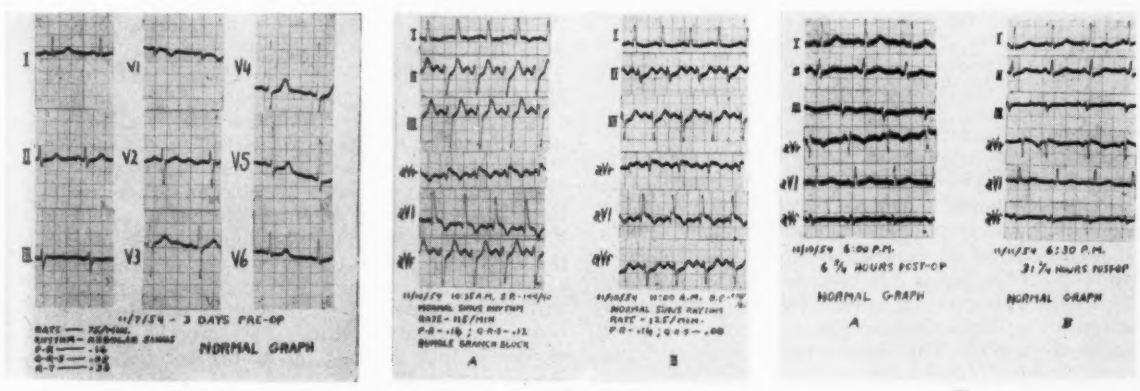


Fig. 6. Cardiac arrest with survival. Electrocardiograms of a 52-year-old female. Operative procedure: closure of external abdominal fistula, wedge resection of ileum. Anesthesia: "one-shot" spinal, Pentothal sodium. 7:50 a.m.: Anesthesia started. 8:25 a.m.: Surgery begun. 9:29 a.m.: Peripheral cyanosis appeared. 9:30 a.m.: Pulse rate 36/minute. Picrotoxin, 9 mg. and atropine sulfate, 1/100 grain. 9:31 a.m.: Adrenalin, 0.5 cc., intravenously. 9:32 a.m.: Surgeon unable to palpate aortic pulse in abdomen. Left thoracotomy immediately performed and heart massaged. 9:35 a.m.: Active cardiac contractions commenced. 9:38 a.m.: Heart rate 160/minute, rhythm regular. Operation continued without further interruption; completed 11:25 a.m. (A) Normal preoperative electrocardiogram. (B) The first strip (A), recorded 1 hour following cardiac arrest, shows sinus tachycardia and bundle branch block. In the second strip (B), recorded 1½ hours after cardiac arrest, duration of QRS has decreased, but S-T deviations and T wave abnormalities persist. Operation is still in progress. (C) Postoperative tracings show no residual abnormalities. Convalescence was uneventful.

result in irreversible cerebral damage.[1] All authorities stress the urgency for re-establishment of the circulation and oxygen system without delay. Endotracheal intubation must be rapidly accomplished and the lungs aerated by the anesthetist as the surgeon incises the chest and massages the exposed heart. These are the essential factors.

Several additional procedures, differing in minor details, have been outlined for cardiac resuscitation. A discussion of these is beyond the scope of this paper. In general, injection of epinephrine into the right ventricular cavity is usually advocated for hearts in standstill that do not respond after 2 to 3 minutes of massage. These injections are repeated at intervals, if necessary, as massage is continued. Electric shock is utilized to convert fibrillation into standstill. Procaine is sometimes injected into the ventricles if fibrillation does not respond to electric shock. Massage of the heart is interrupted only momentarily as these steps are instituted.

The condition of cardiac arrest, if quickly recognized, is definitely amenable to treatment. Courage, speed, and perseverance on the part of the surgeon and anesthetist have recalled many of those who stood before the gates of Paradise (Fig. 6).

Summary and conclusions

Electrocardiographic studies have shown that the majority of patients under general anesthesia have disturbances of cardiac rhythm. While in most cases these may be transient and benign, serious ventricular arrhythmias do occur with considerable frequency. Most cases of cardiac arrest are preceded by characteristic arrhythmias which serve as warnings of impending asystole. These arrhythmias are amenable to proper therapy, but the anesthetist must first be aware of their presence. Only 6.5 per cent of cardiac irregularities that occur during general anesthesia are detected by the palpating finger. This obviously indicates a need for adjunctive diagnostic aid—specifically, the electrocardiograph. The continuously recording cardioscope (cathode ray electrocardiograph) is ideal for this purpose, and its routine use in the operating room is suggested.

Hypoxia, hypercapnia, and acidosis have been shown to augment cardiac inhibition and potentiate vagal reflexes. They are undoubtedly of major importance as causative factors in the production of serious cardiac arrhythmias and cardiac arrest. An open airway, adequate oxygen, and avoidance of depression of the circulatory or respiratory transport systems are mandatory to the safety of the patient. Competent and diligent assisted respiration throughout the period of anesthesia, with provision for escape of expired gases, has been recommended as a preventive measure against hypercapnia and respiratory acidosis.

Precipitation of ventricular fibrillation, hypotension, and cardiac arrest has been demonstrated repeatedly in the experimental animal following rapid conversion of a high alveolar concentration of carbon dioxide to normal. This posthypercapnic phenomenon bears a striking resemblance to clinical cases of cardiac arrest that have occurred following completion of surgery. It is suggested that the practice of rapidly hyperventilating a patient with oxygen at the conclusion of the operation be discontinued and that he be gradually "weaned" to an atmosphere low in carbon dioxide tension.

In view of the inadequacy of clinical signs for the detection of early hypoxia during general anesthesia, a suitable portable instrument, such as the ear oximeter, provides an invaluable safety measure. Cyanosis is a sign of severe hypoxia. Likewise, some method for rapid analysis of the patient's expired gases for determination of carbon dioxide tension, suitable to routine operating room use, is needed. The unreliability of clinical signs of hypercapnia during anesthesia has been stressed.

The anesthetic agent itself may be a factor in the production of arrhythmias. The halogenated hydrocarbon anesthetics in particular are notably toxic to the heart and other organs. In many cases, however, deleterious results are produced by overconcentration of the agent and too little oxygen. This constitutes maladministration and is not an indictment of the anesthetic. Even some of the more toxic anesthetics can be administered safely by an expert who is aware of their potentialities and observes the proper precautions.

Care has been advocated in the use of certain drugs during anesthesia. With curare, the danger is asphyxia; with procaine, cardiac conduction block. The usefulness of these agents is not questioned, but their lethal powers are respected. Epinephrine is known to precipitate ventricular arrhythmias with all types of general anesthetic agents and, except for the ventricular asystole of cardiac arrest, is best avoided during general anesthesia.

Cardiac arrhythmias are common in all planes of anesthesia. Aside from effects due to overconcentration of the anesthetic agent or to evocation of reflexes not yet abolished (anesthesia too light for the surgical procedure), the frequency of cardiac arrhythmias does not appear to be related to the depth of anesthesia per se.

There is considerable evidence to indicate that the vagovagal reflex, so frequently incriminated as the culprit in cardiac arrest, is relatively innocuous in the absence of associated deleterious factors. In the adequately ventilated experimental animal (dog), it has been found impossible to produce cardiac arrest by strong electrical stimulation of the reflex arc of the vagus nerve. Temporary cardiac arrest produced by such stimulation under conditions of hypoxia or asphyxia is followed in a short time by ventricular escape, with an ectopic focus subserving the function of cardiac pacemaker. In man, under general anesthesia, electrical and other types of stimulation of the intact vagus nerve in the thorax have produced at the most only transient and minor electrocardiographic abnormalities.

It is necessary to look farther than the vagus nerve for a satisfactory explanation of cardiac arrest. When asphyxia is carried to the level of respiratory arrest and if oxygen is not then supplied to the lungs by positive pressure, cessation of cardiac activity follows. This is equivalent to strangulation. Similarly, if the asphyxial gasps of a patient are prevented by the action of an anesthetic agent or a paralyzing drug and assisted respiration is not instituted, the heart will, of course, soon stop beating. This may be sufficient to explain at least some of the deaths that have occurred during endotracheal intubation. In certain cases, this simple chain of events may also be responsible for death later in the course of anesthesia. It does not, however, explain cardiac arrest that precedes complete respiratory center failure. Hypoxia and hypercapnia may well initiate the mechanism by augmenting cardiac inhibition and potentiating vagal reflexes. Some one, or a combination, of complex factors apparently then

prevents the evocation of ventricular escape or converts the escape mechanism into a malignant arrhythmia leading to ventricular fibrillation.

In some cases, the direct toxic action of certain anesthetic agents or drugs may tip the balance. Sensitivity reactions may be hidden during anesthesia. A multiplicity of preanesthetic and anesthetic agents may give rise to synergisms not well understood. Reactions to blood transfusions can occur with no one aware of their presence.

Perhaps preoperative evaluation and preparation of the patient have not always been adequate. It is known that certain individuals are particularly susceptible to the development of malignant cardiac irregularities during anesthesia. Patients with structural heart disease, certain metabolic and endocrine disorders, and histories of ectopic cardiac rhythms should be recognized before surgery, adequately prepared if possible, and suitable precautions taken at the time of operation. Acidosis and electrolyte imbalance must be searched for and corrected since these conditions directly affect cardiac conduction and rhythmicity. Superimposition of the above factors upon vagal reflexes, hypoxia, and hypercapnia may be sufficient to precipitate cardiac arrest.

Heart Station
Philadelphia College of Osteopathy
48th and Spruce Sts.

Acknowledgments

Gratitude is expressed to William F. Daiber, D.O., Chairman of the Department of Osteopathic Medicine, Philadelphia College of Osteopathy, and to other members of the Department, whose training and guidance are deeply appreciated.

Much credit is due John E. Burns, D.O., former Resident in Anesthesiology at the Hospitals of the Philadelphia College of Osteopathy, for his assistance and cooperation in obtaining electrocardiograms on patients under anesthesia. Selections from these electrocardiograms have been used as illustrative material in this thesis.

References

1. Hosler, R. M.: Manual on cardiac resuscitation. Charles C Thomas, Springfield, Ill., 1954.

2. Bonica, J. J.: Anesthesia and surgery in cardiac patient, in Clinical cardiology, edited by F. C. Massey. Williams & Wilkins Co., Baltimore, 1953, pp. 962-1011.

3. Kurtz, C. M., Bennett, J. H., and Shapiro, H. H.: Electrocardiographic studies during surgical anesthesia. J. Am. M. A. 106:434-441, Feb. 8, 1936.

4. Lennox, W. G., Graves, R. C., and Levine, S. A.: Electrocardiographic study of fifty patients during operation. Arch. Int. Med. 30:57-72, July 1922.

5. Fisch, C., Pickett, M. E., and Failey, R. B., Jr.: Electrocardiographic changes during general anesthesia. J. Indiana M. A. 47-121-126, Feb. 1954.

6. Maher, C. C., Crittenden, P. J., and Shapiro, P. F.: Electrocardiographic study of viscerocardiac reflexes during major operations. Am. Heart J. 9:664-676, June 1934.

7. Jaruszewski, E. J., Hellerstein, H. K., and Feil, H.: Electrocardiographic studies during cardiac surgery. Circulation 7:175-191, Feb. 1953.

8. Orth, O. S.: General anesthesia I: Volatile agents, and II: Gaseous agents, in Pharmacology in medicine, edited by V. A. Drill. McGraw-Hill Book Co., New York, 1954, part 2, pp. 5/1-6/8.

9. Levine, S. A.: Acute cardiac upsets, occurring during or following surgical operations. J. Am. M. A. 75:795-799, 1920.

10. Bellet, S.: Clinical disorders of heart beat. Lea & Febiger, Philadelphia, 1953.

11. Gerbode, F.: Cardiac arrest, in International symposium on cardiovascular surgery, Henry Ford Hospital, 1955, edited by C. R. Lam. W. B. Saunders Co., Philadelphia, 1955, pp. 396-402.

12. Keown, K. K.: Anesthesia ofr cardiac surgical operations, in Surgery of Heart, by C. P. Bailey. Lea & Febiger, Philadelphia, 1955, pp. 23-37.

13. Fell, E. H.: Problem for anesthetist and surgeon: cardiac arrest. Surg., Gynec. & Obst. 97:111-112, July 1953.

14. Sloan, H. E.: Vagus nerve in cardiac arrest; effect of hypercapnia, hypoxia and asphyxia on reflex inhibition of heart. Surg., Gynec. & Obst. 91:257-264, Sept. 1950.

15. Beecher, H. K., and Murphy, A. J.: Acidosis during thoracic surgery. J. Thoracic Surg. 19:50-70, Jan. 1950.

16. Taylor, F. H., and Roos, A.: Disturbances in acid-base balance during ether anesthesia; with special reference to changes occurring during thoracic surgery. J. Thoracic Surg. 20:289-295, Aug. 1950.

17. Maier, H. C., Rich, G. W., and Eichen, S.: Clinical significance of respiratory acidosis during operations. Ann. Surg. 134:653-658, Oct. 1951.

18. Miller, F. A., *et al.*: Respiratory acidosis: its relationship to cardiac function and other physiologic mechanisms. Surgery 32:171-183, Aug. 1952.

19. Campbell, G. S.: Cardiac arrest; further studies on effect of pH changes on vagal inhibition of heart. Surgery 38: 615-634, Sept. 1955.

20. Best, C. H., and Taylor, N. B.: Physiologic basis of medical practice. Ed. 6. Williams & Wilkins Co., Baltimore, 1955.

21. Cullen, S. C.: Anesthesia in general practice. Ed. 3. Year Book Publishers, Chicago, 1951.

22. Council on Pharmacy and Chemistry, A. M. A.: Fundamentals of anesthesia. Ed. 3. W. B. Saunders Co., Philadelphia, 1954.

23. Weisberg, H. F.: Water, electrolyte and acid-base balance. Williams & Wilkins Co., Baltimore, 1953.

24. Miller, F. A., *et al.*: Development of, and certain clinical applications for, portable mass spectrometer. J. Thoracic Surg. 20:714-728, Nov. 1950.

25. Goodman, L. S., and Gilman, A.: Pharmacological basis of therapeutics. Ed. 2. Macmillan Co., New York, 1955.

26. Eisaman, J. L., *et al*: Cardiac arrhythmias during anesthesia; comparison of cyclopropane and pentothal-nitrous oxide-ether anesthesia. Am. J. Surg. 86:23-28, July 1953.

27. Beckman, J.: Pharmacology in clinical practice. W. B. Saunders Co., Philadelphia, 1952.

28. Whitehead, R. W., and Virtue, R. W.: General anesthesia III: Intravenous agents, in Pharmacology in medicine. *Op. Cit.*, ref. 8, part 2, pp. 7/1-7/9.

29. Ahlquist, R. P.: Adrenergic drugs, in Pharmacology in medicine. *Op. cit.*, ref. 8, part 7, pp. 26/1-26/31.

30. Morton, D. R., *et al.*: Effect of intrathoracic vagal stimulation on electrocardiographic tracing in man. Surg., Gynec. & Obst. 96:724-732, June 1953.

31. Friedberg, C. K.: Diseases of heart. Ed. 1. W. B. Saunders Co., Philadelphia, 1949.

32. DiPalma, J. R.: Diagnosis and therapy of cardiac arrhythmias, in Clinical cardiology. *Op cit.*, ref. 2, pp. 821-906.

Additional References

Foa, M.: Ricerche elettrocardiografiche su individui sottoposti a vari tipi di anestesia. Arch. ital. di. chir. 47:37-62, 1937.

Johnstone, M.: General anaesthesia and cardiac inhibition. Brit. Heart J. 13:47-55, Jan. 1951.

Legrand, R., Desruelles, D. J., and Manouvrier, D.: Perturbations électrocardiographiques au cours des interventions chirurgicales. Presse méd. 59:742-744, May 26, 1951.

Skin testing

Despite past controversy as to the value of skin testing, most allergists agree that with respect to inhalants and pollens it is a valuable diagnostic procedure. Skin testing serves the following purposes: (1) confirmation of suspected sensitivity to specific allergens, elicited as clues in the patient's history; (2) determination of possible sensitivities not suspected; (3) measurement of the degree of skin reaction, which serves as an index of skin tolerance and a guide for future treatment.

Testing can be done by either the scratch or the intracutaneous technic. The choice of method should depend on familiarity with the technics and on past experience. The material used is not interchangeable for both technics.—A. M. Tocker, M.D., *Postgraduate Medicine*, November 1956.

SPINAL ADAPTATION to environmental STRESS

A radiologic evaluation*

CHARLES D. OGILVIE, D.O.
Dallas, Texas

OSTEOPATHIC PHYSICIANS are particularly aware of the extensive adaptation man's back must undergo to compensate for the multitude of environmental stresses that assail it. It would seem unlikely that such extensive facilitative changes can occur without visible structural alterations in the vertebral column. It was with some surprise, therefore, that I discovered that there is little mention in the medical literature of the radiographic manifestations of spinal adaptation to environmental stress. A venture into this virgin field, with its vast ecologic implications, presents a challenge to our profession in general and to the osteopathic radiologist in particular.

Man and his environment

For many centuries, medical scholars have speculated on the role that man's environment plays in the maintenance of health and the causation of disease. Man is uniquely vulnerable to physical, chemical, and social stress. He has been described as a tinkerer—he tinkers with his habitat while other animals hold their peace with it.[1] One might add that besides tinkering with his habitat, he likewise tinkers with the genus Homo itself. Fortunately, man is wondrously endowed with far-reaching compensatory mechanisms which maintain his homeostasis. Claude Bernard once described the healthy man as a piece of consistency moving in a world of variables.[2] More recently, health has been defined as the natural capacity of the human organism to resist and combat noxious influences in the environment and to compensate to their effects.[3] Conversely, disease results when the body fails to maintain a normal state of homeostasis because of inability to make an adequate response to forces or because the adaptive response in itself may be destructive in nature.[4] We may well accept the ancient hypothesis that the healthy man is the one who is at peace with the gods of his environment.

But modern science tells us that we are more than subject to the pressures of environment—we are continuous with it. For instance,

> Through the process of respiration, the organism is chemically so united with its environment that the two can be separated only in the abstract way in which we separate the water of two tributaries which have flowed together in a common river bed.[5]

The force of gravity renders man equally indivisible from his physical environment. The evolution to the erect posture placed him in eternal warfare with a mysterious and ever-present enemy—gravity. In a far distant age man, by some mysterious mechanism, attained his upright bipedal stance. This was a pre-eminent achievement by which he was ordained to a status unique in the animal world. His feet were literally placed on a path toward world domination, but only at the sacrifice of the mechanical stability enjoyed by his predecessors.[6]

> The magnificent cantilever bridge of the quadruped animal, sturdily yet flexibly supported on four rugged pillars, with the weight of body evenly distributed throughout its entire length has, in man, been converted to a makeshift skyscraper with the spinal column balanced vertically and precariously on one end.[3]

The revolt of man against gravity is, perhaps, the singular act that placed his physical well-being in jeopardy and may well be a grossly underestimated cause of human illness. The objective demonstration of the processes by which man compensates to the upright position in the presence of gravitational force is the primary consideration of this discussion.

Physiologic spinal stress

The bony spinal column is subjected to two types of mechanical force: extrinsic gravitational compression and intrinsic myofascial tension. The distribution of these forces through the skeletal structures can be graphically recorded in the roentgenogram. It is depicted both in the form of bone and in the arrangement of the trabecular pattern of the internal cancellous structure in accordance with Wolff's law which states that every change in form and function is followed by certain definite changes in internal architecture and external conformation in accordance with mathematical laws. The configuration of the trabecular design of bone to conform to a pattern of mechanical stress has been exhaustively demonstrated in the upper femur. Galileo, in 1638, referred to the importance of the form of this bone. Later, Koch, Ward, Wolff, and recently Tobin and Gibson have made additional similar observations.[7]

An example of the pattern of extrinsic gravitational compression is the vertical columnar striations seen in the vertebral bodies (Fig. 1). These lines of force correspond to the upright weight-bearing pattern. Their presence is an inherited characteristic, endowed by the possible 60,000,000 years that man has been standing upright.[8] In each individual, however, these stria are carefully altered and are custom made to conform to the particular stress requirements of the individual.

The intrinsic type of mechanical force, myofascial tension, also produces lines of stress in osseous structure (Figs. 2 and 3). Jansen, Carey, and others have placed particular emphasis on the back pressure vectors of muscular pull on bone.[7] This may be demonstrated in the trabecular pattern of the transverse process of the vertebral body where the lines are unrelated to gravitational compression but correspond to the tension exerted by muscular pull. This is even more graphically demonstrated by the back pressure lines seen in the calcaneus at the insertion of the Achilles tendon

*Presented at the Sixtieth Annual Convention of the American Osteopathic Association, New York City, July 19, 1956.

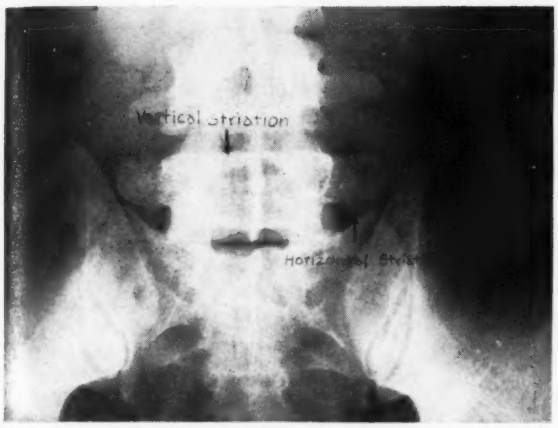


Fig. 1. Anteroposterior view of spine demonstrating lines of gravitational compression in vertebral bodies and lines of intrinsic myofascial tension in trabecular pattern of transverse processes.

(Fig. 3). Again these patterns vary from individual to individual, according to personal requirements.

The configuration of these tension and compression patterns tell with mathematical accuracy the story of the particular stress form of an individual. They reflect his racial stock, habitus, sex, posture, occupation, and age. Theirs is a story of compensation and adaptation of man to his environment, which is imperfectly interpreted and inadequately appreciated by the physician of the midtwentieth century.

Pathologic spinal stress

The borderline that separates physiologic from pathologic stress is, indeed, a nebulous and ill-defined no man's land. Welch[9] described the latter as actually being an extension of the former. Just as physiologic stress is reflected in the form and pattern of living bone, so are pathologic mechanical forces reflected in certain changes in the skeleton that are visible on the x-ray film. The first bony adaptations in response to pathologic forces are difficult to detect unless the normal for the particular individual in question has been previously established, which is highly improbable. Therefore, deviations declared pathologic must consist of gross departure from the norm of the general population. This unsatisfactory criterion will prevail until more is known concerning the intimate details of normal bone structure patterns.

The roentgenologic manifestations of spinal adaptation to environmental stress may be classified as follows: (1) primary morphologic changes, (2) secondary compensatory changes, and (3) degenerative changes.

Before a consideration of these changes is undertaken, it must be pointed out that pathologic stress may be the result either of excessive forces, such as extremely heavy lifting, or of the inability of the organism to adapt to stress not excessive under ordinary circumstances, as in osteomalacia.

Primary Morphologic Changes.—

This group includes basic deviations in bone form. Examples of these malformations are bizarre development of vertebral processes, abnormal development of articular facets, and contour changes of the vertebral bodies. These bony deviations are commonly referred to as anomalies. It is my contention that many of these deformities are not true anomalies, rather, I believe the majority of them result from aberrant stresses that are initiated in the spine during its cartilaginous and most malleable stage of development. Primary morphologic changes probably begin in very early childhood since the patterns of mechanical force are initiated in the spine when the child attains the upright posture and they progress thereafter. It is significant that, at this age, the skeletal system is incompletely developed, the majority of the structures being either completely or partially preformed in cartilage. If prolonged stress patterns are excessive, asymmetrical, or otherwise aberrant, it seems reasonable to conclude that a reflection of these forces will be manifest in the structure and form of the undeveloped skeletal components of the spine. Wolff's law is thus reinforced by the immaturity of the bone structure.

The etiologic hypothesis that these malformations represent congenital anomalies is a position that appears to be highly inconsistent with biologic law: first, because of their recorded incidence in a predominant segment of the population; and second, because of their affinity for the lumbosacral area, which has been described as the recipient of more congenital anomalies than the sum of those seen elsewhere in the body. I agree that the high incidence of malformations in this area is due to the fact that this is the particular part upon which the greatest mechanical stress of back func-

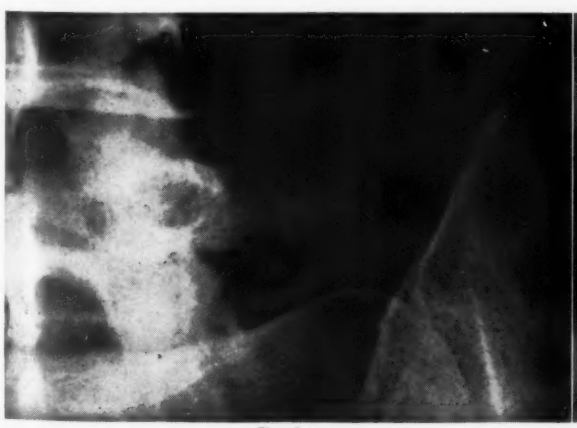


Fig. 2

Fig. 2. Anteroposterior view of transverse process depicting lines of force that correspond to myofascial tension but are unrelated to gravitational compression.

Fig. 3

Fig. 3. Lateral view of calcaneus depicting back pressure vectors as illustrated by trabecular pattern at insertion of Achilles tendon.

tion falls.[10] I do not deny that such true anomalies as agenesis, errors of segmentation, synostosis, and others do occur. My contention is, however, that the incidence of true spinal anomalies is much less than is supposed.

Radiologists, orthopedists, and others interested in body mechanics point an accusing finger at the etiologic scapegoat, anomalous lumbosacral facets. Deviations in the planes of the articular surfaces or departures from bilateral symmetry are thought to predispose to mechanical low-back instability. There is, however, considerable disagreement among authorities as to just how these facet planes should face. Opinion varies from the sagittal school of Ferguson[11] and Brailsford[12] all the way to the coronal school of Putti.[13] Agreement is unanimous, however, that if low-back stability is to be preserved placement of the facet planes must be bilaterally symmetrical (Fig. 4). Such a precept may be applicable to the manufacture of furniture, but does it apply to man who is a biologic unit subject to and continuous with an environment in which he and his evolutionally imperfect back must compensate?

Is it not conceivable that facet asymmetry is the result of asymmetrical forces that are initiated in the low back during its immature and malleable stage of development? Although not consistent with the norm of the general population, asymmetric facets may represent the ideal when considered in the light of the total stress pattern that is unique to a particular individual. They may well illustrate the ingenious adaptive process of the human body to compensate to mechanical force patterns, even at the sacrifice of anatomic symmetry. It hardly seems reasonable that the natural process that produced bilaterally symmetrical auditory ossicles, mastoid cells, auricles, and carpal bones would suddenly deviate from this pattern unless in response to a stimulus. Furthermore, a vast segment of the asymptomatic population has asymmetrical lumbosacral facets—this further attests to their compensatory origin.

Irregular development of the vertebral prominences, particularly the lumber transverse processes, is a familiar sight to anyone viewing x-ray films. Variations in size, contour, and symmetry occur with surprising frequency. Overdevelopment of the transverse process of the fifth lumbar vertebra, the so-called bat-wing process, is frequently described as a vertebral anomaly. The same mechanism that produces articular facet deviations is applicable to bat-wing formation (Fig. 5). This variant may well be nature's handiwork in producing an anatomic change in response to a stimulus that is unique to the stress pattern of the individual. I concur in the prevailing opinion that, in most instances, these processes are asymptomatic. Rather than producing low-back instability, they illustrate its presence by depicting the primitive forces to which the structure has accommodated. Occasionally, the adaptive response itself is destructive.[4] This occurs when the hypertrophic process impinges upon adjacent structures and produces symptoms.

Malformations of facets and transverse processes may occur concurrently with errors of segmentation. This truly congenital anomaly is seen in man and lower animals. In the low back, these consist of partial sacralization of the last lumbar segment or as a partial freeing of the first sacral segment (Fig. 6). These transitional variations may predispose to instability, producing aberrant forces that alter both form and design of facets and processes. It must also be conceded that, in some instances, the mechanism of the production of facet and process variations is probably an indivisible inter-relation of both congenital malformation and adaptive change.

These examples of primary morphologic changes in spinal adaptation to environmental stress demonstrate the alterations in basic bone form and structure that occur in response to mechanical stimuli.

Secondary Compensatory Changes.—

The second category includes those changes which result from environmental stress that is acquired as the individual grows older, that is, the stress of occupation. The aging spine is subject to an increasing number of mechanical forces, and difficulty in compensating to them is accentuated by a loss of tissue resiliency. If the basic anatomic structure of the spine is inadequate for compensation, then certain anatomic changes of reinforcement occur. These are of the stop-gap type and are not of the fundamental magnitude seen in the primary group. Examples of this classification are proliferations at joint margins, ankylosis, eburnation, hypertrophy, and atrophy of bone. Although these changes are frequently observed in x-rays, their true significance is seldom appreciated.

One of the most misunderstood of all compensatory mechanisms is osteophytosis, marginal lipping. This process, which is all too frequently relegated to the junk heap of degenerative osteoarthritis in the radiologist's report, is, I believe, actually a highly spe-

Fig. 4

Fig. 5

Fig. 4. Anteroposterior view of lumbosacral area revealing asymmetric arrangement of articular planes of facets. Fig. 5. Uptilt survey of lumbosacral region demonstrating bat-wing right transverse process of fifth lumbar vertebra which articulates with ala of sacrum.

Fig. 6

Fig. 7

Fig. 6. Error of segmentation. Fifth lumbar vertebra has acquired pronounced sacral characteristics and has become partially incorporated in sacrum. Four normal lumbar vertebrae were noted above. Fig. 7. Pronounced marginal lipping and ankylosis of lumbar spine. Typical example of two degrees of secondary compensatory change which result from pathologic stress.

cialized adaptive innovation of the body (Fig. 7). The application of the term "arthritis" to marginal spurs is incorrect, not only because it falsely implies the presence of inflammatory joint disease, but also because it implies the presence of a specific etiologic entity. Osteophytosis represents a response of bone to an overwhelming stimulus. The proliferations are a last-ditch stand of the spinal column against the onslaught of forces to which the naked vertebra has been unable to compensate. They may be described as the sandbags of nature deposited to combat the rising tide of environmental forces. All roentgenologists are well aware of the robust middle-aged day laborer who has never had a backache in his life but whose vertebral margins are studded with osteophytes. Radiologists have, likewise, observed the predominance of spur formation on the concavity, where the greatest stress occurs in scoliosis. Isolated proliferative changes are often seen at the margins of an injured intervertebral disk, performing a most valuable adaptive service of containment which not only prevents further degeneration but also restricts encroachment of the disk substance upon vital adjacent structures. The recognition of osteophytes as secondary compensatory mechanisms will go a long way toward clarifying the bugaboo of spinal arthritis.

Another secondary compensatory change is eburnation. This alteration in the internal structure of bone is actually hyperostosis in response to mechanical stimulus (Fig. 8). Well visualized on the x-ray film, it is commonly seen at the site of aberrant osseous articulations, such as a bat-wing process with the ala of the sacrum. Unfortunately, the term "osteitis" has been applied to this entity, carrying with it implications of bone inflammation. The changes noted, however, represent nothing more than a reinforcement of structure to withstand the traumatic insult of additional mechanical stress. This alteration is in conformance with Wolff's law.

Degenerative Changes.—

In the discussion of the primary and secondary mechanisms, I have pointed out the far-reaching structural and morphologic changes that bone will undergo in response to the stimuli excited by gravitational and myofascial forces. However, in the face of overwhelming stress, the homeostasis of the individual may be overcome and frank disease ensue. The third group contains those numerous and challenging pathologic entities that are classified as the degenerative diseases.

Degenerative processes may be reversible or irreversible. The femur may sustain a traumatic insult to which the bony structure is unable to adapt. This may result in disruption in the continuity of the bone, a fracture. It could be said that a degenerative process has occurred, but it is reversible, and the body proceeds to heal the fracture. Should the fracture heal in such a manner that the limb is short and excessive weight is placed upon the hip joint above, degeneration of the articular cartilage may ensue with loss of joint space; an irreversible degenerative process known as static arthrosis has occurred.

Besides reversible and irreversible degenerative changes, there are both adult and childhood types. Decompensation of bone due to stress is by no means exclusively an adult problem. There are numerous examples of juvenile decompensations which result from static insult. A very common example of this is osteochondritis. Osteochondritis of the spine, or Scheuermann's disease, is aseptic necrosis of the diaphyseal plates of the vertebral bodies occurring in the midthoracic and lower thoracic regions. A high incidence has been described in adolescent farm boys who ride tractors and do other heavy chores that produce prolonged and excessive stress on the vertebral bodies. The rapidly growing epiphysial structures are particularly vulnerable to traumatic insult. Delay or arrest of union with degeneration of the epiphysis occurs. It is interesting to note that the sites of predilection are either subject to gravitational compression or musculofascial tension and that the degree of incidence is in direct proportion to the forces exerted, the hip, vertebral bodies, and tibial tubercle being most commonly affected. An ecologic approach to the medical riddle of osteochondritis offers some very logical explanations for a heretofore poorly understood condition.

Degenerative manifestations in the adult are more varied than those in children. Two conditions merit special consideration in this discussion. Spondylolisthesis is a displacement of the vertebral body secondary

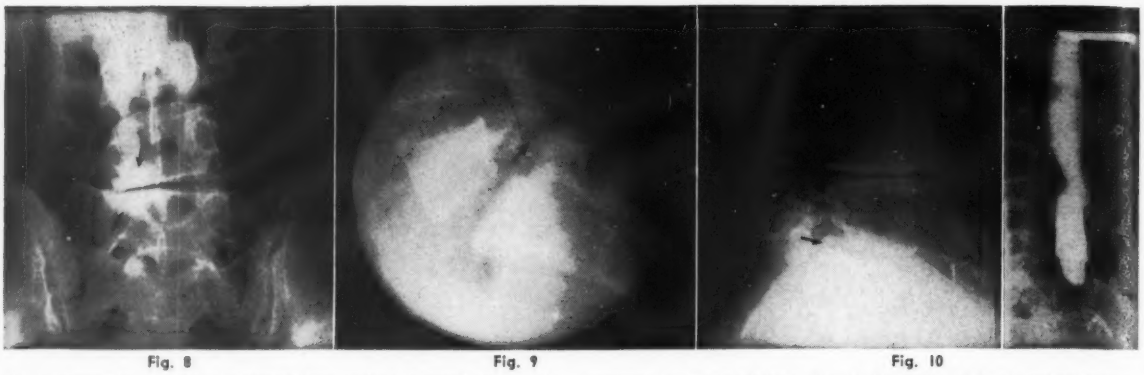


Fig. 8

Fig. 9

Fig. 10

Fig. 8. Eburnation at point of abnormal bony contact. Hyperostosis is manifest by chalky whiteness of contiguous bony surfaces. Fig. 9. Spondylolysis of isthmus of neural arch. Lesion closely resembles fatigue fracture and is precursor to spondylolisthesis. Fig. 10. Narrowing of fourth lumbar intervertebral space due to degeneration of intervertebral disk with herniation of nucleus pulposus.

to spondylolysis of the isthmus of the neural arch (Fig. 9). It has long been regarded as an etiologic enigma. Recently Hadley[14] has propounded the question, "Is spondylolisthesis a fatigue fracture?" It is well known that healthy bone can undergo spontaneous fracture as a result of stress applied beyond the capacity of the structure. The so-called march fractures of the shafts of the metatarsals are examples of this. Bone exhaustion occurs as a result of excessive stress, as in marching or carrying heavy loads. Hadley raises the point of whether spondylolysis, the precursor of spondylolisthesis, is not also a fatigue fracture. When one notes the high incidence of spondylolisthesis in obese individuals with accentuated lumbosacral lordosis, this theory seems most plausible.

The second example of adult degenerative change in the spine is disease of the intervertbral disk. This fibroelastic cushion is the recipient of much mechanical stress, and excesses may produce degenerative change. Radiographic evidence of such is sometimes visible as Schmorl's node, which is displacement of the nucleus pulposus into the body of a vertebra. Prolonged gravitational pressures may excite atrophy of the disk structure with subsequent narrowing of the intervertebral space, also a sign radiographically visible.

Of major importance in the disk problem is rupture of the annulus fibrosus with herniation of the nucleus pulposus, so-called ruptured disk (Fig. 10). This condition can seldom be diagnosed by x-ray unless a contrast medium is utilized. Numerous authorities believe that a degenerative process must precede herniation. Bradford and Spurling[15] state:

> The early decadence of the intervertebral disc contributes to its vulnerability. Because of the constant stress and strain brought to bear on the intervertebral discs, any incipient pathology may become exaggerated without the occurrence of a severe traumatic episode.

Disk disease is a classic example of the degenerative change that results from inadequate spinal adaptation to environmental stress.

Conclusions

In recent years Selye[16] has repopularized an old term in medical nomenclature, "stress." This was the initial sign of what has proved to be a rapidly developing reorientation in curative medicine, away from the etiologic dogma of the bacteriologic school, and a return to the concept of man, the biologic unit, the environmental creature who is part of and continuous with his surroundings. But new horizons are won only by taking untried roadways that are fraught with untruths.

The radiologist practices a specialty that has known no other philosophy than that of curative medicine. His concern is with the specificities of practice as he surveys the elusive silver shadows of the x-ray with an impersonal and, all too often, hurried eye. Small wonder that the voluminous literature of this specialty contains so pitifully little about the patient who has the disease. It has been my desire, in this brief excursion beyond the confines of roentgen orthodoxy, merely to point out an unexplored field of medical investigation. The osteopathic profession is obligated to continue its quest for new truths concerning man in health and disease. By virtue of our philosophy and training, the field of physical ecology offers a particular challenge to the resources of osteopathic research.

1141 N. Hampton Rd.

References

1. Neutra, R.: Survival through design. Oxford University Press, New York, 1954.
2. Galdston, I., ed.: Beyond the germ theory. Health Education Council, New York, 1954.
3. Korr, I. M.: Biological basis for osteopathic concept. J. Osteop. 61:13-19, April 1954.
4. Wolff, H. G.: Stress and disease. Charles C Thomas, Springfield, Ill., 1953.
5. Neutra, R.: *Op. cit.*, ref. 1, p. 12.
6. Goff, C. W.: Postural evolution related to backache. Clin. Orthop. 5:8-16, 1955.
7. Tobin, W. J., and Gibson, M. M.: Internal architecture of femur from clinical viewpoint. Privately published, Washington, 1954.
8. Jones, F. W.: Hallmarks of mankind. Williams & Wilkins, Baltimore, 1948.
9. Welch, W. H.: Adaptation in pathological processes. Johns Hopkins Press, Baltimore, 1937.
10. Willis, T. A.: Man's back. Charles C Thomas, Springfield, Ill., 1953.
11. Ferguson, A. B.: Roentgen diagnosis of extremities and spine. Paul B. Hoeber, New York, 1941.
12. Brailsford, J. F.: Radiology of bones and joints. Ed. 5. Williams & Wilkins, Baltimore, 1953.
13. Putti: Cited by Brailsford, J. F.: *Op. cit.*, ref. 12.
14. Hadley, L. A.: Fatigue fracture of fifth lumbar neural arch; is spondylolysis a stress fracture? Clin. Orthop. 6:110-113, 1956.
15. Bradford, F. K., and Spurling, R. G.: Intervertebral disc. Ed. 2. Charles C Thomas, Springfield, Ill., 1947.
16. Selye, H.: Physiology and pathology of exposure to stress. Acta, Montreal, 1950.

Additional References

Bean, W. B.: Caritas medici. Arch. Int. Med. 92:153-161, Aug. 1953.

Kraus, E.: Anomalies as cause of low-back pain. J. Am. Osteop. A. 43:1-8, Sept. 1943.

Lewin, P.: Backache and sciatic neuritis. Lea & Febiger, Philadelphia, 1943.

Sigerist, H. E.: Medicine and human welfare. Yale University Press, New Haven, Conn., 1941.

Wolff, H. G.: Stress and adaptive patterns resulting in tissue damage in man. M. Clin. North America 39:783-797, May 1955.

The
JOURNAL
of the AMERICAN
OSTEOPATHIC ASSOCIATION

Editor RAYMOND P. KEESECKER, D.O.
Associate Editor KATHERINE BECKER

This periodical is the official scientific publication of the
AMERICAN OSTEOPATHIC ASSOCIATION

President ROBERT D. McCULLOUGH, D.O.
Executive Secretary TRUE B. EVELETH, D.O.
Business Manager WALTER A. SUBERG
Treasurer ROSE MARY MOSER

Editorials

Research in an osteopathic college

MORRIS THOMPSON
President
Kirksville College of Osteopathy and Surgery
Kirksville, Missouri

"While research work is carried out by individuals, the fact remains that, today, research is an activity of institutions." With these words, I. M. Korr, Ph.D., opens the discussion of the implementation of research opportunities by colleges in the lead article of this issue of THE JOURNAL. The paragraphs that follow trace briefly and in chronological order the development of policies, aims, and practices of research in one of the six osteopathic colleges.

Research is Hydra-headed. Each question stated, pursued, and answered satisfactorily raises two or more engaging new questions. Each frontier of new knowledge slowly conquered opens new and unknown horizons of great fascination. Any institution which makes research its business—and in which there is the necessary excitement in the pursuit of new knowledge and the asking of new questions—finds research hard to maintain in balance. Further, it finds its understanding of the potential of research for human welfare always far outrunning its capacity for research. The research program at the Kirksville College of Osteopathy and Surgery, although its extent is ten times that of a few years ago, still seems to those most closely involved to be "barely off the ground" in relation to its potential and the need of society.

However, the aim here is to describe the development of research in one institution up to its present degree, and the limits of space demand that that be done with little further attention to the philosophy and values of research in general. Those areas are well treated by Dr. Korr in his presentation.

In setting up any long-range project, two points must be borne in mind: Practices not based on policies tend to be random; policies not declared, written, and often reviewed become vague, and forgotten, whereupon practices suffer.

Early in 1945, already embarked on a research program of some significance, the Board of Trustees of the Kirksville College of Osteopathy and Surgery, upon administrative recommendation, adopted a set of basic policies of which the following related to research:

> It is the policy of the College that Research shall be an important obligation of its teaching staff: that, in general, the nature and direction of research shall be dictated by the interest and qualifications of the individual and shall be subject to direction by the Board and Administration only to the extent that it is expected that members of the teaching faculty of the College shall be interested in and sympathetic toward the problems of osteopathy. The Board well recognizes that fundamental research in the laboratory branches which may be removed from the problems of clinical osteopathy, nonetheless is of importance to osteopathic education and is, in many cases, related to and supportive of osteopathic clinical research.

Other aspects of the policy statement dealing with full-time employment of teachers and advanced study also helped create the basis for practices which encourage research.

Intermediate between policies and practices come aims. These, too, must be written, declared, often reviewed, and used as a constant measure of accomplishment. In 1951 the Board declared the following set of official aims of the College:

1. To prepare for society osteopathic physicians adequate to the requirements of general practice and provide opportunities for graduate and postgraduate education of practicing physicians.
2. To provide the best of health service to the public.
3. To acquire new knowledge through research to serve the above purposes.
4. To acquire resources with which to prosecute the prior aims to the fullest.

Research is considered one of three primary aims so interrelated that no one can be removed without weakening the others. Discussion as to the "service" aspects of research is considered strictly academic since the policies as stated established its importance per se as well as its irreplaceable value in relation to aims numbers 1 and 2.

What, then, of practices as they grow out of policies and aims?

In practice in the College, these policies and aims

produce first the intangible "atmosphere" to which Dr. Korr refers. This is a sense of shared responsibility in which at least a majority of all those concerned with the College recognize that research is a proper, necessary, and important function of the College.

Some specific landmarks, which may help to describe the intangible, follow. In 1946 the administrative office of Director of Research was created and filled by an experienced and able investigator-teacher-physician. The responsibilities of the post are to serve as aide to the President in planning, evaluating, encouraging, interpreting, and directing the research *affairs* of the College. In 1949, in recognition of the fact that the title improperly implied some direction of actual research, the word "Affairs" was appended. This officer is a member of the Administrative Council of the College. He reports to the President and the Board at each meeting of the Trustees.

In addition to this officer, the President, the Dean, and the Treasurer of the College consider administrative concern with attention to and responsibility for research a proper, important, and ever-present part of their jobs. Major space in the College plant is allocated to research. This space is constructed, altered, maintained, and serviced from the general funds of the College.

In the recruitment of new faculty members, research interest and capacity are identified as important and desirable qualities, and on occasion new people are added for the primary—although never exclusive—purpose of developing certain areas of research capacity. The major salary load for active researchers, particularly principal investigators, is carried by the general funds of the College. In order to help with the recruitment of younger scientists and supportive personnel who are paid all or in part from grant funds, the College makes specific provision for reasonable tenure, regardless of the duration of the grant.

The College has for many years spent more from general funds for supportive and ancillary personnel, maintenance, and administration directly related to research and for principal investigators' salaries than the total of grants received for research from outside agencies. Indeed, although debt like death frequently has many contributing causes, the entire current debt of the College is related to its determination to maintain a program of research bearing significant proportion to its total program.

The matter of proportion is especially important, for too often research is considered an activity to be carried on in years of affluence and discarded in years when funds are depleted. To use a simile—research must be an ingredient of the institution's cake and not just the frosting. It must be an inseparable part of the whole and not a luxury to be dispensed with if time and funds are short. If research is an integral part of the whole, no matter how large or how small the total program—the cake—research will have its proportionate support and make its proportionate contribution.

Research must be reviewed, analyzed, planned, and evaluated continuously at the operating level and occasionally "in full dress" at the trusteeship level in order to assure that it is in proper balance in the institution and to help keep alive at all levels the atmosphere of awareness of research as a proper and necessary function of the institution.

In 1953 the Board of Trustees of the Kirksville College studied a twenty-six-page, single-spaced report prepared jointly by the President and the Director of Research Affairs. In this report the historical development of the research program of the College was reviewed. The objectives, present status, publications, personnel, and physical plant involved and the outside grants to each area of the program were presented. The value, the cost, and the risk of the research program for the College were analyzed. The basic policy set forth above was reviewed and reaffirmed by the Board of Trustees and a supplementary statement of current position was developed and adopted as follows:

> Be it resolved that it is the intent of the Kirksville College of Osteopathy and Surgery to fulfill its responsibilities to the profession and society in the production of new knowledge through research to the fullest possible measure within the limits of its resources and consistent with a balanced and equitable attention to the other proper aims and purposes of the College. Be it further resolved that it be the specific direction of the Board of Trustees of the College that its President with the cooperation of its investigators and others make every effort to acquaint the profession, the public and the granting agencies with the cost of the research program to the College and bend every effort to secure from those sources greater support for the general costs associated with research.

It is the intent of this simple statement of the policies, aims, and practices of research under osteopathic auspices in one institution merely to describe a situation which has made possible a degree of accomplishment. To this College it has been a challenge to much greater accomplishment.

Osteopathic orientation forces investigators to ask Nature new and probing questions involving answers that can lead to better human health. The search for those answers lies within the genius of the scientific mind—the genius of quest. When they are evolved, their reporting is the work of a disciplined, informed, and dedicated individual. But it is the business of institutions to provide the work-climate that is produced only in an atmosphere of shared objectives.

Thirty-Three Years

A short, typed message carrying a clear-cut signature found its way to every desk of the Headquarters Staff of the American Osteopathic Association shortly before employees left for their Christmas holiday. It stated the simple fact that its writer was drawing his period of service with the Association to a close on December 31. To those of the Staff who had known him through years of work together, and to others with an innate sensitivity to human worth, the message bespoke the man—a fine and kindly person, considerate, balanced, modest, who life-long has preferred to be disadvantaged rather than to take advantage. Words pile up, words rarely needed to portray an individual in the world of business today, or any day. Yet it is by such words that this man will be remembered by the many, from those whose first and last business

conferences with him span more than a quarter of a century to those who have come to know him only within the year. To the older members of that group he is Clayton Clark, Gentleman; to the younger, knowing no such old-fashioned phrases, he is an anomaly, but one to be respected.

The farewell note of this long-time officer of the Association should be shared with its members. It will occasion older doctors to think and some to say the word of gratitude to a man whose life work has been to turn a furrow of their ground. A younger and more active body of physicians need to realize the continuity of effort that the message uncovers, for it is in continuity carried to fruitage that the strengths of the osteopathic profession root themselves today. This is the message:

> After 33 years as Business and Advertising Manager of the American Osteopathic Association, I am terminating my services as of December 31. As I say "good-bye" to this fine group of co-workers, let me wish you all a very Merry Christmas, personal Happiness in the New Year and much Success in your continued service with the Association.
>
> CLAYTON N. CLARK

It has been said that an institution is the lengthened shadow of a man. Actually, it is the lengthened shadow of many men—men who stand upon each other's shoulders; even the ground on which they stand is human achievement. The American Osteopathic Association as representative of organized osteopathy is a case at point. Prior to 1912, the Association had no salaried officers, relying entirely upon the dedicated efforts of field doctors. A headquarters office was instituted in the fall of 1912 with the employment of a secretary-editor; the addition of a second and then a third employee marked the beginnings of a staff that took on the added duties of business manager and treasurer—the four positional responsibilities being assigned in varying combinations to the "staff." On June 17, 1922, an A.O.A. Central Office was established in Chicago in two small rooms at 623 Wabash Avenue. On September 1, 1923, Clayton N. Clark, D.O., came as an additional staff assistant. He was soon made Business Manager, the first full-time liaison agent between organized osteopathy and the world of business and commerce.

Commenting on the position of Business Manager within the A.O.A., THE FORUM in its cover story for January, 1955, had this to say of the now-retired Business Manager:

> Dr. Clark in point of years of service to organized osteopathy is successfully challenged by only one other salaried officer. . . . During this period, [1923-1955] he has witnessed a remarkable change not only in the professional status of osteopathy, but also in its economic position in the pharmaceutical, medical and surgical supply market. The profession's position in the market place has become a secure, commanding one.

Growth and development seem integral to American institutions. The position of the osteopathic profession in today's medical market place would appear even to the casual observer as no happenstance, although it would suggest nothing especially notable or other than natural growth. An examination of THE JOURNAL advertising pages from 1923 to the current issues of Volume 56 seems to substantiate this natural growth. Further study of advertising pages, limited to the period of osteopathic history referred to above, might suggest the obverse to natural growth—the change in both quality and quantity of advertising could seem phenomenal. The truth of the matter lies in neither observation.

In 1923, when Clayton Clark made his first representations to the medical-supply world, with too few exceptions, he was met with rebuff. To the ethical business world of the healing art profession, osteopathy was an outsider. In the face of rumors of possible boycott, it took courage for reliable and reputable drug houses to brave the opposition of organized medicine by advertising in THE JOURNAL. It took greater courage, however, for a young Business Manager to stave off the charlatan and the huckster, ready to pre-empt the pages of a publication representative of a new and growing profession, and one already giving promise of buying power.

It was the job of the Business Manager to make it possible for the A.O.A. to publish a professional periodical and to do it with little subsidy from the organization itself, for but little was available. This labor was undertaken in the face of closing doors, doors not always closed gently, and especially by those who rated themselves beyond reproach. It was mandatory for this young advertising agent not to become disheartened and discouraged—he had to go back to knock again, and always as the professional gentleman. That is the early story of one man's 33 years. It must be with pleasure now, and it should be with a genuine sense of pride and achievement, that Clayton Clark, D.O., until but recently the Business Manager of the American Osteopathic Association, looks upon the harvest of the furrowing and planting of more than 3 decades.

The Association's needs of the last few years have grown beyond its resources, even though its resources have increased beyond foreseen measure. So pressing are these demands that some have felt that the osteopathic profession's practices and buying power should be more forcibly exploited in the medical market. The commercial world has become one of quotas, each year's to be exceeded by that of the next. It is as true for medical manufacturers and suppliers as it is of business generally, and it would seem not always for the good of medicine. Thoughtful critics of modern society question if current business practices, whereby everyone is pressured to buy so much that they neither need nor perhaps can afford, may be for the good of the nation itself. Be that as it may, we live and we survive in a work-a-day world. It was in this world that Clayton Clark worked long, laying for his profession a foundation so solid that what comes hereafter will rest safely and securely upon it.

Dr. Clark and Mrs. Clark are rich in resources for interesting living, promising rewards for a man who has lived the good life. THE JOURNAL would express for the osteopathic profession its warm appreciation of and its best wishes for both man and wife. The many who know and admire them personally will speak for themselves. Separation from arduous duty is rightfully due Clayton Clark, but he cannot be separated from the profession in its institutionalized form, for his contribution remains a nourisher for the years that lie ahead.

Postgraduate teaching program

News comes out of osteopathic leadership in New York City and New York State that carries significance to the osteopathic profession nation-wide. The heading to this column is but a third of a story that involves plans not only for a postgraduate teaching program related to the LeRoy Hospital and the New York Osteopathic Clinic, but which envision a graduate school and a research institute—truly, an osteopathic center for America's world-metropolis.

The dream of a graduate center located in New York City and serving Eastern osteopathy has not come lately to the city and state, but not until July 1956 did it become a matter for serious discussion. Acting as the initiating body, the Foundation for Research of the New York Academy of Osteopathy sponsored a luncheon meeting during the Sixtieth Annual A.O.A. Convention at which a temporary postgraduate development committee was set up, with the definite purpose of determining whether or not so ambitious a project was a possibility. The Foundation insured the breadth of this organizational meeting by having representatives present from New York City's two institutions, leaders from the city and state societies and the local Academy of Osteopathy, and guests with broad responsibilities at the national level from without New York State.

The Postgraduate Development Committee has now been given status as a subcommittee of the Board of Directors of the New York Hospital and Clinic.

Appointments were made by Mr. Thomas Larkin, president of the Board, after consultation with representatives of five local osteopathic organizations. The permanent chairman is Dr. William B. Strong, a past president of the New York State Osteopathic Society. Five special subcommittees have been named; with their respective chairmen, they are as follows: Diagnostic Service, Dr. J. Marshall Hoag; Facilities, Dr. William D. Miller; Research, Dr. Walter M. Streicker; Curriculum and Faculty, Dr. Jacob B. Sheetz; Public Relations and Public Affairs, Dr. Sydney M. Kanev. The Postgraduate Development Committee has named advisers from a national level.

Just prior to the 1956 A.O.A. Convention, THE JOURNAL pointed to Osteopathic Hospital and Clinic—the two units—as representing a 42-year fruition, nationally noteworthy, but emphasizing as more noteworthy the potentiality inherent in the fact. What had been done in New York City was called a beginning, a seed planted that proved viable, resulting in a development and growth oak-like in character.

This specific statement was made:

> The significance of the two units of the New York Hospital and Clinic as now developed lies in its possibility as an initiating force resulting in an osteopathic graduate center in New York City. . . . Graduate study in osteopathic medicine must be able to bring to its students an awareness of the nature of osteopathic medicine presented in contradistinction to the nature of modern medicine. No group is better able to make this contribution than the continuing osteopathic membership of New York City and its environs.

THE JOURNAL salutes the Postgraduate Development Committee and its subcommittees as they start forward on the long road ahead. They, indeed, have "miles to go," not before they "sleep," but before the morning. It was said, in July, of New York City's doctors of osteopathy and their friends that "never dies the dream." And so be it, when plans are carefully laid, the cost counted, and no man looks backward. Living and dead, what a cloud of witnesses surrounds the men of New York City!

The Educational Supplement

For the ninth consecutive year THE JOURNAL carries as an integral portion of its January issue a section termed the Educational Supplement. It is an annual report of the Office of Education of the American Osteopathic Association, recognized as the authoritative document on the education of doctors of osteopathy. Four thousand reprints of the Supplement are distributed annually; many go to preprofessional advisers and deans of approved colleges, those offering training to students planning to enter an osteopathic or medical school. Upon request, the Supplement is also distributed among vocational guidance counselors of secondary schools, college officials, executive officers of educational organizations, and other groups that wish to be informed of the educational status of the Physician and Surgeon, D.O.

The Supplement also deserves an annual reading by osteopathic physicians, many of whom are so preoccupied by their professional duties that they lag behind in knowledge of their profession's place in the educational world. They would do a service to their friends and patients who are educators by loaning them this issue of THE JOURNAL as a matter for their information. Many of our doctors do not appreciate the amount and degree of interest shown by informed laymen who want to know the facts aboue osteopathic education and do not know how to get them. Again, it must be emphasized that the Supplement is an authoritative document, one that can be entirely substantiated and that is accepted as such by educational institutions throughout the United States.

A new department

In the columns of this issue of THE JOURNAL, are published the first "Case Reports," constituting a new department. For a long time it has been recognized that some of the most pertinent observations in clinical medicine are included in case reports, which seldom come to the attention of anyone except attending physicians or, at most, the staff members of the hospital where the patient is treated.

With the initiation of this new Department, it is hoped that attention will be called to the importance of many single cases, with the result that those on which

sufficient data is available will be put into narrative style and submitted to THE JOURNAL, to be considered for publication. An outline suggesting the information to be included is available upon request from the Editorial Department of the American Osteopathic Association.

Annual Congress on Medical Education and Licensure

The Annual Congress on Medical Education and Licensure in which the Federation of State Medical Boards of the United States is an active participant will be held on February 10-12 in Chicago. This Annual Congress furnishes an opportunity for all physicians to learn of modern problems of and approaches to medical education and licensure. D.O.'s serving on boards of medical examiners have long found attendance at the Annual Congress necessary to the proper performance of their governmental positions. Members of boards of osteopathic examiners should also plan to attend these meetings which are open to all interested physicians and lay persons. All boards licensing doctors of osteopathy have similar problems relating to education and licensure, and many of the most critical of these problems find their solutions at these meetings. Comments concerning this year's program may be found under the heading of the Bureau of Public Education on Health in this issue of THE JOURNAL. A review of the agenda items will indicate that attendance at the Annual Congress would benefit all D.O.'s serving on licensing or examining boards.

Case Reports

Erythroblastosis fetalis due to the Kell factor

NORMAN W. ARENDS, D.O.
Huntington Woods, Michigan

RECENTLY Levine[1] made the statement that, excluding ABO incompatibility, it may be estimated that close to 99 per cent of all hemolytic disease will be due to anti-D and the remaining 1 per cent to intragroup antibodies other than anti-D. Included in the low-incidence group is the Kell factor. This was discovered in 1946 by Coombs, Mourant, and Race[2] in the serum of a woman who had delivered an infant thought to be suffering from hemolytic disease. In 1949, Levine and his associates[3] found a factor and named it after the family in which it was found, the Cellano factor. Since that time, the antithetical relationship of the Kell-Cellano factors has been established for the K-k system of antigens. A few examples of hemolytic disease due to this factor have been reported and are always of interest. A report of a case recently seen on the autopsy service of the Department of Pathology of Detroit Osteopathic Hospital follows.

Clinical history

A 25-year-old white female was admitted to the hospital in active labor on January 31, 1956, at 1:30 a.m. The first day of her last menstrual cycle had occurred in March 1955. The expected date of confinement was sometime in December 1955. The patient gave a history of irregular menstrual cycles and flow. Nausea and vomiting had occurred during the first trimester, and quickening was experienced in July. She had had viral pneumonia during the latter part of October, and diarrhea had occurred twice weekly during the last month of pregnancy. There had been a weight gain of 50 pounds. The patient's past history was essentially normal, and an inventory of the organ systems revealed no unusual findings.

However, the patient's obstetric history was unusual. She was a gravida VII, para II. She had given birth to a live baby in 1949 and one in 1954. She had had a spontaneous abortion in 1949, in 1950, in 1951, and in 1954. These had all occurred at about the fourth month, the causes being undetermined.

The patient was 5 feet 2 inches in height and weighed 175 pounds. The blood pressure was 140/100; the pulse was 76. Findings of the physical examination were essentially normal. The uterine fundus was well above the umbilicus, and contractions were occurring regularly. Rectal examination revealed cervical dilatation of 1½ fingers and the head at station —1. The fetal heart tones were 148 per minute; the membranes were intact. Diagnosis was of uterine pregnancy at term.

The laboratory reported the patient's blood as Rh positive. Titration was performed to determine the presence of anti-Rh. Saline or albumin agglutinins were not found. The indirect Coombs test was negative. A Kahn test also was negative. The erythrocyte count was 5,010,000 per cu. mm., hemoglobin 98.5 per cent or 15.3 grams per 100 cc. The leukocyte count was 14,500 per cu. mm., with stab cells, 2; segmented cells, 78; lymphocytes, 19; and monocytes, 1. Urinalysis showed specific gravity 1.022, and albumin 3+. There were 1 to 3 leukocytes and 5 to 6 erythrocytes per high

powered field and an occasional cylindroid and mucus. Fibrinogen determination, by the turbidimetric method, showed 0.36 grams per 100 cc. of blood. The blood group was A and the genotype cDE.

Labor progressed uneventfully until 5:50 a.m. at which time the fetal heart tones were 130, cervical dilatation was Ac, and the head was at station +1. Saddle anesthesia was then utilized. A very precipitous labor followed, during which the fetal heart tones faded. Immediate delivery was accomplished from a right mentoanterior presentation, and during delivery massive abruptio placentae was discovered. A stillborn infant delivered spontaneously at 6:15 a.m., and the placenta and membranes were expelled at 6:16 a.m. Autopsy of the infant was requested.

Autopsy

External Examination.—The body of the well-developed male infant weighed 3,210 grams. The crown-rump length was 36.4 cm.; the crown-heel, 56.9 cm. Edema of the face and eyes, areas of ecchymosis over the body, and moderately severe icterus were present. There were 5.3 cm. of tied icteric cord attached. The testes were palpable in the scrotum. The posterior fontanel was nearly closed.

Internal Examination.—

The panniculus was approximately 0.3 cm. in thickness, and the thymus weighed 4 grams and appeared grossly normal.

The heart measured 5.4 by 3.6 by 2.8 cm. and weighed 24 grams. There were petechial hemorrhages beneath the visceral pericardium. The chambers and valves appeared to be well formed. The myocardium was very soft. The great vessels were of average normal configuration; the ascending aorta measured 0.6 cm., the pulmonary conus 0.8 cm., the ductus arteriosus 0.7 cm., and the thoracic aorta 0.7 cm., in diameter.

The left lung weighed 24 grams, and the right weighed 34 grams. Both lungs showed evidence of having been well aerated. The pleurae were undistorted.

The liver weighed approximately 200 grams and measured 9.5 cm. in height. It showed evidence of marked congestion, and there was a brownish-red discoloration of the cut surface.

The spleen weighed 24 grams and measured approximately 7.3 by 4.8 by 2.8 cm. Its cut surface also was brownish-red.

The stomach, showing evidence of ulceration, was filled with a thick green fluid. There were no unusual findings in the remainder of the gastrointestinal tract.

The right adrenal gland weighed 9 grams; the left adrenal, 8 grams. There was evidence of congestion.

Each kidney weighed 16 grams and showed evidence of congestion. The ureters were normal. The bladder was distended to approximately the level of the umbilicus and contained 25 cc. of amber-colored urine. The urethra was patent.

When the cranium was opened, marked protuberance of the occipital bone in the area over the inion was noted. No tears of the tentorium cerebelli falx cerebri could be found. There was no evidence of hemorrhage or of kernicterus.

The placenta, which was submitted separately, measured 18.5 by 16.2 by 4.3 cm. and weighed 840 grams. The cotyledons were quite fleshy. There was an area on the placenta which could possibly have resulted from infarction. There were 27 cm. of umbilical cord eccentrically attached. Much coagulum was submitted with the placenta.

Gross anatomic diagnoses: Generalized congestion, hepatomegaly, splenomegaly, icterus, and erythroblastotic placenta (?).

Microscopy.—

Sections of the thymus showed well-developed lymphoid structure in which numerous well-developed Hassall's corpuscles were noted.

Sections of the heart revealed well-developed endocardium, myocardium, and pericardium. There were no other noteworthy cardiac findings.

Sections of the lungs revealed few distended or expanded alveoli. There was an occasional focus of erythropoiesis.

Sections of the liver showed heavy concentration of cytochromes within the polygonal cells. There was evidence of excessive extravascular hematopoiesis with nearly every lobule distorted to a considerable degree because of this.

Sections of the spleen showed numerous areas of hematopoiesis among congested sinusoids.

Sections of the pancreas showed well-developed islands of Langerhans. The acini were well developed.

Well-developed glomerular tufts were evident in kidney sections. There were moderate congestion, some evidence of tubular casts, and foci of hematopoiesis beneath the pelvic epithelium.

There was evidence of interstitial hemorrhage in the cortex of adrenal gland sections. Also noted in one section was hyperplasia of the medullary substance, and islands of hematopoiesis were found in the adrenal substance.

Congestion was present in brain sections, but cord sections and pituitary sections were normal.

Calcific and hyaline changes and some areas of infarction were noted in placental sections. There was evidence of endothelial proliferation and persistence of Langhans' cells. The villi were more cellular than those usually found.

Microscopic Diagnosis: Erythroblastosis fetalis, hyperplasia of the adrenal medullary substance, and congestion.

Immunohematologic Consultation.—

Samples of blood from the mother and father were sent to Dr. Philip Levine at the Division of Immunohematology of the Ortho Research Foundation. He reported that the father's blood type was group A, genotype CDe, Rh postive (R^1R^1), and Kell positive (heterozygous) and the mother's blood type was group A, genotype cDE, Rh positive (R^2R^2), and Kell negative. He

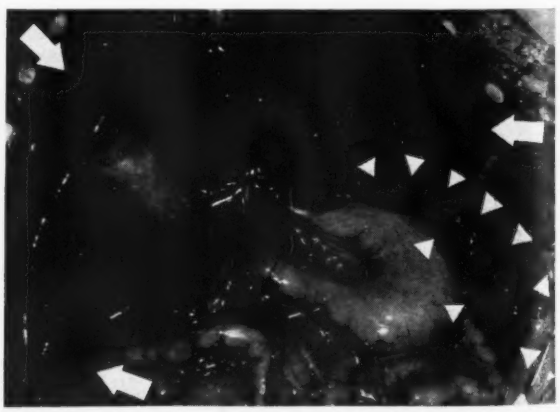


Fig. 1. Erythroblastosis fetalis due to the Kell factor. Note the size of the liver (indicated by arrows) and that of the spleen (outlined by triangles) in relation to the size of the stomach.

also reported that the mother's serum contained anti-Kell at a titer of 1:256 but that it was not likely that the abortions were due to serologic incompatibility.

Cause of Death.—Stillborn. Fetal causes: Hemolytic disease of the fetus (Kell factor). Maternal causes: serologic incompatibility (Kell factor).

Comment

The profound changes found in the stillborn caused us to believe that death was due to erythroblastosis. It might be argued, however, that death in this instance may have been due to abruptio placentae. The rapidity of delivery by an experienced obstetrician, the marked jaundice, and considerable hepatomegaly and splenomegaly (Fig. 1) led us to believe that the true underlying cause of death was the hemolytic disease and that abruptio placentae was only contributory.

It is interesting to note that the repeated abortions had aroused considerable suspicion of the existence of serologic incompatibility and also as to the correctness of the blood typing. It was for this reason, or as a check measure, that the anti-Rh titer was determined. The absence of a history of transfusion, the normal progression of fetal development, the well-being of the mother, and the uneventful labor (until late) seemed to indicate the suspicions were unfounded. The fact that the parents' blood had been previously found to belong to group A appeared to eliminate the possibility of ABO incompatibility. The likelihood that this patient was a chronic aborter appeared much greater than the possibility of the existence of one of the rare intragroup antibody incompatibilities. Time proved the coexistence of the two situations, and the outcome was most likely unalterable.

The insight and the suspicion of the attending physician in the case are rare. All too frequently, upon receipt of a laboratory report that a mother's blood is Rh positive, physicians conclude that the possibility of erythroblastosis, or hemolytic disease, has been entirely eliminated. The 1 per cent of cases due to factors c, E, and K, and to private blood factors are forgotten, as is the possibility of ABO incompatibility.

This case emphasizes the necessity for obstetricians, pediatricians, and pathologists to keep such matters before the attention of the general staff. Many need to be educated, and many need reminding since their participation in this phase of practice is only occasional.

Collection of samples of blood from fathers for grouping and typing must become a more common procedure during the prenatal period. Fortunately, most of the rarer incompatibilities produce milder forms of hemolytic disease, but this cannot be used as an excuse when clear-cut and specific diagnosis is available and better treatment and care can be given. Early diagnosis in most communities opens up possibilities for treatment by teams of physicians thoroughly acquainted with the problem and possibility for maximum salvage.

Summary and conclusions

1. A case of erythroblastosis fetalis due to the Kell factor has been presented.

2. Physicians need to become better acquainted with the problem of hemolytic disease in infants of Rh-positive mothers.

3. Blood grouping and typing of both mother and father during the prenatal period are required for maximum salvage of infants.

13119 Sherwood Drive

References

1. Levine, P.: Hemolytic disease due to antibodies other than anti-D. Rev. hémat. 10:215-226, 1955.

2. Coombs, R. R. A., Mourant, A. E., and Race, R. R.: In-vivo isosensitisation of red cells in babies with haemolytic disease. Lancet 1: 264-266, Feb. 23, 1946.

3. Levine, P., *et al.*: Kell-Cellano (K-k) genetic system of human blood factors. Blood 4:869-872, July 1949.

Additional References

Race, R. R., and Sanger, R.: Blood groups in man. Charles C Thomas, Springfield, Ill., 1955.

Wall, R. L.: Practical blood grouping methods. Charles C Thomas, Springfield, Ill., 1952.

Wintrobe, M. M.: Clinical hematology. Ed. 4. Lea & Febiger, Philadelphia, 1956.

Polycythemia produced by overtransfusion

A. A. GOLDEN, D.O.
Wilmington, Delaware

BLOOD TRANSFUSIONS are not without inherent danger and, in spite of greatly improved safety, the mortality directly attributable to blood transfusion is not negligible. It is estimated that even in the best managed institutions, the mortality rate from blood transfusion is approximately 1:1,700, making this as frequent a cause of death as anesthesia or appendicitis.[1]

The availability of blood since the widespread establishment of blood banks has resulted in an enormous increase in the use of blood transfusion in clinical medicine. This increased availability and use of blood have produced various problems and complications, namely: (1) homologous serum jaundice, (2) hemolytic reaction due to incompatibility, (3) depression of erythropoiesis, (4) pyrogenic transfusion reaction, (5) hemoglobinuric nephrosis, (6) transfusion hemochromatosis, and (7) artificial or iatrogenic polycythemia.

In the desire to increase the hemoglobin percentage, it is sometimes forgotten that rapid administration of blood in large quantities to elderly persons is dangerous. A rapid increase in blood volume not infrequently precipitates cardiac failure and pulmonary edema. This may occur not only in persons with cardiac disease, but also in patients with sound hearts; the aging process[2] impairs the capacity to withstand increased loads.

It is important to emphasize that patients in whom the hematocrit reading is elevated or normal should not be overburdened with blood. It is just as unwise to allow the hematocrit reading to rise above the range of 45 to 50 per cent as it is to allow the continuation of severe anemia. There have been instances in which patients have been given an excess of blood and have as a consequence become polycythemic. It has been shown that such patients do not undergo anesthesia or withstand operation as well as those who are not plethoric.[3] The increased volume of erythrocytes is known to increase blood viscosity and thereby to decrease capillary blood flow and increase peripheral re-

sistance.[4,5] The decreased blood flow and increased peripheral resistance, if sufficient, may lead to cardiovascular collapse. The following case report describes such an occurrence.

Case report

A 67-year-old woman was admitted to Riverside Hospital on May 29, 1956, for cholecystectomy and possible subtotal gastrectomy. On entrance the blood findings were: hemoglobin 8.5 grams, erythrocytes 3,200,000 per 100 cc., hematocrit reading 39 per cent, and blood pressure 160/84. Compatible blood, six units (500 ml. per unit), was administered over a 3-day period.

In the operating room on June 5 the blood findings were: hemoglobin 17 grams, erythrocytes 6,500,000 per 100 cc., hematocrit reading 59 per cent, and blood pressure (following premedication) 168/90.

Premedication was administered 45 minutes prior to induction of anesthesia and consisted of intramuscular promethazine hydrochloride, 50 mg., combined with scopolamine, 0.32 mg. This was considered satisfactory.

Anesthesia was induced at 7:48 a.m. by means of 150 mg. of 1 per cent thiamylal sodium, followed by a drip of succinylcholine chloride, 0.2 per cent, to facilitate orotracheal intubation, which was readily accomplished at 7:50 with a no. 8 cuffed Magill tube. Nitrous oxide-oxygen, 50:50, was used for maintenance anesthesia, with succinylchloride drip, 0.2 per cent, for the required muscular relaxation.

The operation was begun at 8:00. At this time, blood pressure was 180/100, and the pulse rate was 70 per minute.

At 8:25 the pulse rate was 50 per minute and regular. After 10 minutes the pulse rate remained unchanged, and atropine sulfate, 0.32 mg., was administered intravenously.

At 8:40 the pulse rate was 118, and respiratory distress became evident in the form of noisy, bubbling rales, gurgling type of respiratory sounds, and a sense of resistance to the assisted respirations. A diagnosis of acute pulmonary edema was made by the anesthesiologist; it was believed due to hypervolemia or myocardial failure or both.

Bloodless phlebotomy by means of a ganglionic blocking agent was decided upon in order to lessen the load on the right heart,[6,7] and 5 mg. of Pendiomide were administered intravenously. The blood pressure was reduced from 190/110 to 110/70, but the pulse remained 118 per minute. A suction catheter was inserted through the endotracheal tube, and pink frothy mucus was removed.

The cholecystectomy was completed uneventfully, and extubation was performed at 9:15. An electrocardiogram made at this time showed depression of the ST segment and a normal sinus rhythm. The pulse rate was 78 per minute. There was questionable myocardial damage. The postanesthetic course and postoperative course were uneventful, and the patient was discharged from the hospital on June 15.

Comment

Several questions come to mind which are incompletely answered:

1. Did the use of atropine as treatment for the bradycardia provoke the episode of pulmonary edema because the resultant tachycardia produced incomplete emptying of the ventricles and so caused pulmonary back pressure?
2. Did the hypervolemia, with the resultant increase in intrapulmonary capillary pressure, combined with the hypertension, produce the pulmonary edema?
3. Was there actual myocardial failure as a primary factor with the concomitant hypertension "triggering," the onset of failure?

It is believed that artificial polycythemia induced by excess blood transfusion resulting in overloading of the circulation was the chief cause of the events described in this clinical report.

1009 Madison St.

References

1. Straus, B., and Torres, J. M.: Use and abuse of blood transfusion. J. Am. M. A. 151:699-701, Feb. 28, 1953.

2. Harrison, T. R., *et al.*, eds.: Principles of internal medicine. Blakiston Co., New York, 1954.

3. Barbour, C. M., Jr.: Polycythemia in relation to anesthesia and surgery. Anesthesiology 11:155-163, March 1950.

4. Mendelowitz, M.: Effect of anemia and polycythemia on digital intravascular blood viscosity. J. Clin. Investigation 27:565-571, Sept. 1948.

5. Perry, F., *et al.*: Blood volume replacement in surgical patients. S. Clin. North America 36:301-313, April 1956.

6. Ellestad, M. H., and Olson, W. H.: Use of intravenously given ganglionic blocking agents for acute pulmonary edema; preliminary report. J. Am. M. A. 161:49-53, May 5, 1956.

7. Sarnoff, S. J., Goodale, W. T., and Sarnoff, L. C.: Graded reduction of arterial pressure in man by means of thiophanium derivative (Ro 2-2222); preliminary observations on its effect in acute pulmonary edema. Circulation 6:63-73, July 1952.

Why is your patient dizzy?

Dizziness, though not a disease, is a terrifying symptom. It heads the list of unwanted warnings of illness, and for a good reason. After passing through the tumbling and falling episodes of very early life, everyone unconsciously lives by the axiom that the earth is solid and stable, and that his relation to it is fixed. Although we may voluntarily give up this comfortable state, as when we travel by sea or by air, we know what to expect. For the patient with dizziness, however, this trust in the behavior of his surroundings no longer exists. From time to time he has experienced the sensation of movement of his surroundings or himself when reason tells him that they should be still. For him a fundamental law of life has been violated, and he becomes truly terrified. The dizzy patient feels that his sense of security is threatened. It may also be undermined by accompanying nausea and vomiting, and his distress may be further increased by deafness and tinnitus. The dizzy patient, more than many others, deserves the sympathetic attention of every physician.—Gordon D. Hoople, M.D., *Postgraduate Medicine*, November 1956.

DEPARTMENT OF PROFESSIONAL AFFAIRS

ALEXANDER LEVITT, D.O.
Chairman

Committee on Ethics and Censorship

GUS S. WETZEL, D.O.
Chairman

Guide for Administrative Procedure

▶ The Guide for Administrative Procedure set out below has been approved by the Board of Trustees of the American Osteopathic Association in accordance with By-Law authorization. This Guide provides an established procedure to be followed in conducting investigations and hearings when complaints or charges of unethical practice are lodged against individuals.

A profession is given by law many rights and privileges not accorded to other occupations or endeavors. With those rights and privileges, however, comes the responsibility of protecting the public. In general, doctors of osteopathy are mindful of their rights, privileges, and responsibilities, but unfortunately, from time to time, individual doctors stray from the general standards of ethical practice and engage in activities which are detrimental to the welfare of the public and of the profession. The Code of Ethics of the American Osteopathic Association delineates the expected conduct of doctors of osteopathy.

Courts of the land have long looked with favor upon the voluntary regulation of ethical practices and the penalizing of unprofessional or unethical conduct by professional organizations. The term "unprofessional or unethical conduct" is not vague or ambiguous. The Minnesota Supreme Court, in a recent decision, expressed with clarity how easily unprofessional or unethical conduct can be defined by stating that such conduct constitutes activities ". . . which violate those standards of professional behavior which through professional experience have become established, by the consensus of the expert opinion of the members, as reasonably necessary for the protection of the public interest. In establishing the necessity for and existence of such standards, every member of the profession should be regarded as an expert."

OUTLINE OF THE PROCEDURE FOR A HEARING ON CHARGES OF VIOLATION OF THE CODE OF ETHICS

1. Hearing called to order by presiding officer.
2. Member and his representative, if any, requested to appear before Board or Committee.
3. Authority of Board or Committee to conduct hearing stated. (Refer to Section 7 of A.O.A. By-Laws and the Guide for Administrative Procedure.)
4. A.O.A. Code of Ethics identified and copy made part of record.
5. Receipt of hearing notice by member established.
6. Letter of notification made a part of record and charges against member read, citing specific sections or provisions of Code of Ethics purported to be violated.
7. Answer of the member read into the record or absence of an answer noted.
8. Membership status and record of person charged with unethical conduct verified.
9. Chairman of the Committee on Ethics and Censorship and member requested to submit list of names of witnesses. (Witnesses may be excluded from hearing until called to testify.)
10. Chairman of Committee on Ethics and Censorship or his representative requested to present evidence pertaining to charges.
11. Member requested to make statement or present evidence pertaining to charges.
12. Rebuttal of statements or evidence by either Committee or member.
13. Hearing concluded and member excused from hearing.
14. Decision rendered by Committee or Board.

PART I. ORIGINAL HEARINGS OF CHARGES BY THE A.O.A. AGAINST A MEMBER

The Guide for Administrative Procedure, hereafter set out, has been prepared by the Committee on Ethics and Censorship and approved by the Board of Trustees in order that members of the Association may be informed concerning the procedure followed by the Committee and the Board in regard to complaints or charges of unethical conduct in violation of the Code of Ethics.

Hereinafter the word "Committee" refers to the Committee on Ethics and Censorship. The Executive Committee will be referred to as such.

1. *The Charges.—*

A distinction is made between the terms "charges" and "complaints." Charges are the final written complaints of unethical conduct against a member, prepared and approved by the Committee on Ethics and Censorship. Complaints are not formal charges but allegations of unethical conduct or activities submitted by a member, an affiliated organization, or divisional society or prepared by the Committee as a part of an investigation or study of a member, and all allegations filed against a member shall be considered complaints despite the name given to them. Charges may originate from an investigation or study made by the Committee at its own initiation or through a complaint at the initiation of another member, an affiliated organization, or divisional society. The Committee on its own action will dismiss complaints without a hearing where investigation or study establishes that there is no evidence of unethical conduct, or it may dismiss them if the member has agreed to cease and desist from the unethical conduct and no disciplinary action is thought necessary. Where, however, investigation or study on the part of the Committee establishes that there may be a basis for concluding that unethical conduct or activities have occurred and which can be clarified or determined only by a hearing at which the member can present evidence, the complaints will be formalized by the preparation of written charges by the Committee.

When a member or organization desires to file complaints against a member, he shall put such complaints in writing and forward them to the chairman of the Committee on Ethics and Censorship. The Committee shall determine the nature of the complaints and request the member or organization filing

the complaints to submit verifying evidence. The Committee shall inform the member against whom complaints have been filed that the Committee has taken under study the possibility that his activities are in violation of the Code of Ethics. The Committee shall encourage the voluntary termination of unethical activities and the settlement of intraprofessional disputes. However, if the Committee is satisfied that the evidence is such as to warrant a hearing, it shall formulate the charges and request the Executive Secretary to send a letter of notification to the member including the written charges. The letter of notification shall be sent by certified or registered mail, return receipt requested. It shall, if possible, be mailed more than 30 days preceding the date of hearing; if not, it shall be mailed at the earliest possible date. It shall state the section or sections of the Code of Ethics to which the charges relate and the time, date and place of the hearing. It shall also state that the member is invited to appear at the hearing on his own behalf and that he may be accompanied by or represented by counsel or any person of the member's choosing, if such representation is thought desirable or necessary by the member.

Written charges may not be filed against a member by a member or organization. A member or organization may file only complaints to be studied by the Committee. After the complaints have been reviewed by the Committee, they may be made into written charges by the Committee to be forwarded to the member because they are of such a character as to require a hearing to determine their validity and to be the basis for official final action by the Board.

2. The Answer.—

A member shall respond to the written charges contained in the letter of notification by sending a written or typed answer to the Executive Secretary, not less than 10 days prior to the date of the hearing if the letter of notification was mailed 30 days or more preceding the date of the hearing, or 5 days prior to the hearing if the letter of notification was mailed less than 30 days preceding. The answer shall state briefly (1) whether each written charge is (a) denied or (b) admitted, or (c) that he does not desire to contest the charges, but neither denies nor admits them, and (2) whether or not he will be present at the hearing (a) in person, (b) accompanied or represented by a representative, or (c) not at all. The answer shall be made a part of the record in each case. Failure to file an answer shall constitute a default on the part of the member. In such event or if the member has stated that he does not desire to contest or admits the charges and does not desire to appear at the hearing, the Committee or Board shall hear only the evidence which formed the basis for the preparation of the written charges. However, the failure of a member to file an answer with the Executive Secretary may be waived by the Executive Committee, in its discretion and upon request, in case of extraordinary hardship upon the member.

3. The Hearing.—

The letter of notification shall inform the member of the time, date, and place of the hearing. The hearing shall be conducted by a majority of the Committee and in an orderly manner. A court reporter or stenotypist may record the hearing if the Committee is of the opinion that the character of the charges and evidence necessitates such recording. Otherwise, the presiding officer shall designate a person to serve as secretary and take minutes. In any case, if the member requests that a court reporter or stenotypist be available and is willing to pay for the full cost of the services of such court reporter or stenotypist, such service may be provided. In such case, the member shall agree to furnish the Committee, without charge, a sworn copy of the transcript which is prepared.

An effort shall be made to make the time, date, and place of the hearing as convenient for the member as possible, taking into consideration all factors involved.

The hearing shall be called to order by the chairman of the Committee or a member designated by him to preside. Either will hereafter be referred to as the presiding officer. The presiding officer shall determine that a majority of the members of the Committee are present. He shall then determine the names of all interested persons present, including members, witnesses, legal counsel or representatives, and such other persons as the Committee or member has requested to attend. The names shall be recorded. The presiding officer is authorized in his discretion to exclude from the hearing room witnesses who intend to testify at the hearing, except members of the Committee, if such exclusion of witnesses is requested by any member of the Committee or the member charged with unethical conduct. The Committee may require that the Executive Secretary, General Counsel, or such other representatives or employees of the Association as may be designated, be present at all times to assist in the conduct of the hearing.

The hearing then shall proceed with the reading of the letter of notification and charges sent by the Executive Secretary, followed by a statement establishing the membership status and record of the member. The pertinent sections of the Code of Ethics shall be read. The presiding officer, some other member of the Committee, or a person designated by the Committee shall then present in orderly fashion the evidence pertaining to the written charges, which the Committee has in its possession or at its call. The evidence shall be presented in as brief and succinct a manner as possible. Every effort shall be made to expedite the hearing in order to prevent the member from being unduly delayed. The presiding officer, in the absence of a directive to the contrary from the Committee, shall rule upon the admissibility of evidence or questions asked witnesses, either upon the request of other members of the Committee or of the member involved. Specific objections to evidence or testimony shall be noted. The hearing shall be directed at the accumulation and presentation of facts pertinent to the charges, and irrelevant evidence, testimony, or statements shall be excluded insofar as possible. The member or his representative may ask relevant questions of witnesses presenting evidence, if such witnesses are not testifying on behalf of the member, provided that the presiding officer shall determine the appropriate time for such questions. The member or his representative may examine all documentary evidence presented at the hearing under appropriate limitations established by the presiding officer. A copy of any document or publication which is read at the hearing shall be filed with the presiding officer and made a part of the record. The Committee may also ask questions of witnesses or the member.

4. The Evidence.—

The evidence presented at the hearing may be oral or documentary. All evidence shall pertain to the charges of unethical conduct, except where the member involved requests permission to file a statement or make an oral statement in the nature of a plea of justification or request for special consideration, despite the character of the evidence presented. The limitations of time make necessary the presentation of as much evidence in documentary form as is possible. In case of doubt as to its relevancy or materiality, evidence shall be admitted rather than excluded.

5. The Decision.—

As soon after the hearing as possible, the Committee shall reach its decision as to the validity of the charges against a member. A decision shall be reached in every case, even when the member charged with unethical conduct fails to appear at the hearing or to present evidence pertaining to the charges. The decision shall be divided into three parts:

a. Findings of Fact: The Committee shall make specific findings of facts based upon evaluation of the evidence or lack of evidence presented at the hearing.

b. Ethical Conclusions: The Committee shall make ethical conclusions which are based upon the application of the Code of Ethics to its findings of fact.

c. Recommendations: The Committee shall adopt recommendations which incorporate the opinion of the Committee as to the desirability of disciplinary action against a member, or whatever other action the Committee believes the findings of fact and ethical conclusions demand.

The decision shall be reported in writing to the Board of Trustees by the Committee on Ethics and Censorship. At the time the decision is reported to the Board, a copy shall be forwarded to the member involved.

6. The Rights of a Member.—

A member, within reasonable limitations, shall always be given the opportunity to settle with the Committee any complaints concerning alleged unethical conduct. The filing of written charges by the Committee against a member is a serious matter, and the member is encouraged therefore to cooperate with the Committee in the clarification or settlement of any conduct or activities which the Committee has under investigation or study.

The legal right of a membership association to establish a Code of Ethics and to enforce its provisions in order to promote the good reputation and objects of the Association has long been recognized. Members should therefore make every effort to furnish the Committee with evidence of the absence of any unethical conduct or activities, so that the Committee may expeditiously carry out its functions and may discommode members as little as possible. The investigation or study by the Committee of complaints of unethical conduct is purely a procedural administrative matter and does not evidence that there has or has not been unethical conduct or activities.

At the hearing, evidence will be offered to establish the presence or absence of unethical conduct or activities. If personal attendance of the member is impossible, the member may submit by mail documentary evidence which will be made a part of the record of the hearing, or he may request that the hearing be delayed until personal attendance is possible. The Committee will decide whether a delay is justified in any case. If the member arbitrarily refuses to attend the hearing or submit evidence, the hearing will be held nonetheless, and a decision will be reached by the Committee upon the available evidence.

a. The Petition of a Member:

When a member, after the termination of the hearing, has received a copy of the written decision of the Committee and is not satisfied with the decision, he may file with the Executive Secretary a written petition which may be divided into two parts:

1. Exceptions to Decision: The first part of the petition may set out objections to the findings of fact, ethical conclusions, or recommendations which are a part of the written decision of the Committee which is to be submitted to the Board of Trustees for action. The exceptions shall point out errors or mistakes made by the Committee in the preparation of its decision. The exceptions shall point out specific evidence or testimony which disproves the correctness of the Committee's decision.

2. Request for New Hearing or Rehearing: The second part of the member's petition shall pertain to a request for a new hearing or rehearing of the case before the Board of Trustees or the Committee. This request shall specify the grounds for such request and shall be of a substantial character. The failure of a member to appear at the hearing held by the Committee or to present evidence will usually not be considered a substantial ground.

b. New Evidence: A member should recognize that if new evidence affecting the decision of the Committee has developed or come to light since the time of the Committee hearing, the existence of such evidence should be called to the attention of the Committee, which within its own authority may delay submission of its decision to the Board of Trustees until the new evidence has been evaluated by the Committee. Ordinarily, therefore, the development of new evidence is a matter which a member should call to the attention of the Committee in order that it may be made a part of the record of the Committee hearing and its decision rather than a part of a petition of a member for a rehearing before the Board of Trustees.

c. Transmittal of Member's Petition: The petition of a member will be submitted by the Executive Secretary to the Board of Trustees at the time that the Committee presents its decision in the case to the Board. The Executive Secretary shall read the petition in full to the Board immediately after the Committee has presented its decision. The Board will then, after due deliberation, act upon the decision and the petition.

7. *The Board of Trustees.*—

The Board retains full authority to decide all questions as to presence or absence of unethical conduct or activities of a member. As the Code of Ethics recognizes, unethical conduct or activities are not consistent with the public health purposes and objectives of the Association. Upon receipt of the decision of the Committee, the petition of the member, if any, and the record in the case, the Board shall determine the ethical questions. The Board has full authority to approve or disapprove the decision in whole or part and the same principle applies to the petition. The Board may order a complete new hearing before it, a rehearing in part, or a new hearing or rehearing in part before the Committee.

a. Board Hearings: In any case pertaining to unethical conduct or activities on the part of a member, the Committee on Ethics and Censorship or any member of the Association may request the Executive Committee to direct that the original hearing be held before the Board and not the Committee. If the Executive Committee directs that the original hearing be before the Board, the letter of notification shall so state. A member who has received a letter of notification stating that a hearing will be held by the Committee on Ethics and Censorship may by letter to the Executive Committee request that the original hearing be held by the Board. The letter shall be addressed to the Executive Secretary. The Executive Secretary shall notify the member of the action of the Executive Committee on the member's request. Insofar as practical, the Guide for Administrative Procedure shall apply to such Board hearings. In such cases the Board shall conduct the hearing based upon the charges filed by the Committee and shall render a decision, but shall not be required to make specific findings of fact, ethical conclusions, or recommendations as in the case of the Committee. The decision of the Board is final, except as otherwise directed by the Board.

The Board of Trustees has approved and directed the Committee to follow the administrative procedure set out in this Guide in carrying out its responsibilities. The procedure is intended to permit members to present more fully and adequately evidence concerning complaints or charges of violation of the Code of Ethics without being required to submit to the delays and difficulties encountered by the holding of original hearings by the Board. The Board believes that its functions will be promoted by this procedure because the Board will be able to devote the major part of its time at the annual, semi-annual, or special meetings to general public health affairs, which are the objects and purposes of the American Osteopathic Association.

PART II. APPELLATE REVIEW BY THE A.O.A. OF A DISCIPLINARY DECISION OF A DIVISIONAL SOCIETY

An appellate review of divisional society disciplinary decisions pertaining to violations of the Code of Ethics of the American Osteopathic Association is provided for by the Association. Such review is not provided for violations of divisional society constitutions and by-laws wherein they differ from that of the A.O.A. or as they pertain to ethical provisions which divisional societies may enact in their own interests.

A. *By-Law Provisions of the American Osteopathic Association:*

Article IX, Section 7, of the By-Laws provides that the Board of Trustees of the A.O.A. shall perform the final review of any divisional society decision expelling or suspending a member of the A.O.A. from membership in the devisional society for violation of the Code of Ethics of the A.O.A., as follows:

Section 7. The Board of Trustees shall decide finally all questions of an ethical or judicial character and shall have investigated by the Committee on Ethics and Censorship all charges or complaints of violation of the Constitution, By-Laws or Code of Ethics or of grossly unprofessional conduct of any member and shall have the power to censure, place on probation for not exceeding a three-year period, suspend for not exceeding a three-year period or expel a member as the findings warrant. A member may be cited to appear before it by the Board of Trustees or Committee on Ethics and Censorship to answer charges or complaints of unethical or unprofessional conduct. Upon the final conviction of any member of an offense amounting to a felony under the law applicable thereto, such member shall automatically be deemed expelled from membership in this Association; a conviction shall be deemed final for the purposes hereof when affirmed by an appellate tribunal of final jurisdiction or upon expiration of the period allowed for appeal.

If a member shall have been suspended or expelled from a divisional society because of a breach of the Code of Ethics by proper action of such divisional society, the Board of Trustees of this Association shall review the record of such decision. The decision may first be referred to the Committee on Ethics and Censorship for recommendations. If the Board of Trustees shall concur in the action of the divisional society, such member shall be suspended for the same period of time or expelled from this Association upon the same basis as in the decision of the divisional society.

The Board of Trustees is authorized to adopt and amend from time to time in the manner directed by the Board a Guide for Administrative Procedure regulating the procedure applicable to matters involving violations of the Code of Ethics.

Thus an A.O.A. member is subject to disciplinary actions for violations of the Code of Ethics of the A.O.A. whether by the divisional society at the state level or by the A.O.A. at the national level. In the former case, the original hearing is by the divisional society; in the latter, the original hearing is before the A.O.A. Board of Trustees or Committee on Ethics and Censorship. In the former, the A.O.A. reviews the divisional society decision to determine whether the physician's A.O.A. membership should be revoked or suspended, but not for any purpose relating to divisional society membership. Despite the action of the A.O.A., the decision of the divisional society as it pertains to the physician's divisional society membership is unchanged.

The Board cannot, however, be expected to concur in a disciplinary decision of a divisional society when the hearing has not been conducted in accordance with the same general procedure as when such a proceeding or hearing is conducted by the A.O.A. The member's rights are just as much in jeopardy at a review proceeding as at an original hearing.

B. *Procedure Followed by the A.O.A. in Reviewing a Disciplinary Decision of a Divisional Society.*—

The American Osteopathic Association has established procedures for the appellate review of divisional society decisions revoking or suspending the divisional society membership of a member of the American Osteopathic Association. The A.O.A. requires that the divisional society, at its original hearing charging a violation of the A.O.A. Code of Ethics, conform substantially to the same procedure that is followed by the A.O.A. when conducting an original disciplinary proceeding. It recognizes that the procedures need not be identical.

The A.O.A. procedure is outlined in Part I of this Guide for Administrative Procedure. Any procedural matters not covered in the By-Laws of the A.O.A., the A.O.A. Manual of Procedure, or the Guide for Administrative Procedure are conducted in accordance with Robert's Rules of Order.

C. *The Procedure to Be Followed by the Divisional Society.*—

When a divisional society, by action of its governing body, has suspended or expelled from a divisional society for violation of the A.O.A. Code of Ethics a member who is also a member of the A.O.A., the governing board of the divisional society should forward to the Executive Secretary of the A.O.A. for review a record of its disciplinary proceeding and its decision.

The record for review should contain a specific charge or charges alleging violation of the Code of Ethics of the A.O.A. or a divisional society Code where it is the same as the A.O.A. Code, and the charges must identify the specific sections or provisions of the Code which have been violated. The record which the divisional society forwards to the A.O.A. should establish that the accused was furnished a written copy of the divisional society charges and was given due notice of the time and place of the divisional society hearing. It should also contain the evidence that was introduced at the hearing to substantiate the charges and the evidence which was presented by the member in his defense. The review given the divisional society's decision by the A.O.A. Committee and Board is based upon the written or printed record which is presented to them. The A.O.A. cannot review the disciplinary decision if the record is not before it, and it cannot review charges against a member who has not received notice of such charges or had the opportunity to prepare his defense.

The A.O.A. may, upon receiving a request including the reasons for such request being filed with the Executive Secretary, permit a representative of the divisional society and the A.O.A. member whose divisional society membership has been suspended or who has been expelled to appear with counsel at the review hearing conducted by the Board. The Executive Committee shall affirm or deny the request.

The divisional society representative and the member appearing before the Board have much the same status as parties who argue a matter before an appellate court. They may not introduce evidence which was not presented at the divisional society hearing, nor may they introduce evidence pertaining to other charges which may or may not be valid but which, in any event, has not first been heard by the divisional society.

Evidence discovered or complaints filed after the time of the divisional society's decision must be presented first to the divisional society and not to the A.O.A. The divisional society must, under the regulations of the review proceeding, have first weighed evidence and evaluated its merits by reaching a decision prior to bringing such charges or evidence before the A.O.A. Board. The orderly administration of the business of the Association and the divisional society, as well as the fundamental rights of the member, requires that the divisional society conform to this rule.

D. *The Action of the A.O.A.*—

Upon receipt of the divisional society record and decision, the Executive Secretary shall refer them to the Committee on Ethics and Censorship and place the subject on the tentative agenda for the next succeeding meeting of the Board of Trustees.

The Committee shall review the divisional society record and decision. If the Committee is of the opinion that they conform to the general rules, regulations, and By-Laws of the A.O.A. and therefore should be reviewed by the Board, it shall notify the Executive Secretary to place the matter upon the final agenda of the next succeeding meeting of the Board. The Executive Secretary shall notify the divisional society and the member of this fact, and of the time and place at which the Board will review the divisional society's decision. If, however, the Committee is of the opinion that the record is insufficient to comply with A.O.A. requirements, it shall so report and shall recommend that the Board refer the matter back to the divisional society.

If the Committee is of the opinion that the divisional society decision should be reviewed by the Board, it shall make and send to the Board a decision of the same type as described in Part I of this Guide, based on the record presented by the divisional society. Copies of the decision shall also be forwarded to the member and to the divisional society.

Upon receipt of the decision, the member or the divisional society, or both, may file with the Board a petition similar to the petition described under Rights of a Member in Part I of this Guide. At a review proceeding the A.O.A. Board operates solely in an appellate capacity, and the initial responsibility for hearing and evaluating the charges and evidence in such a proceeding rests upon the divisional society before which complaints have been initially filed and which has conducted the original hearing.

At the review proceeding the decision of the Committee is reported, followed by a reading of the petition or petitions by the Executive Secretary, or by the member or the divisional society representative, if present and if he so wishes. The Board retains full authority to take such action and to order such new review hearings or review hearings as it deems advisable and necessary. If the member and divisional society representative are not present and the Board deems their presence necessary, it may defer its decision until such persons are present.

In making their presentations, the divisional society representative and the member are required to confine their remarks to the record before the Board. If the member has new evidence not presented to the divisional society at its hearing and which he believes pertinent to the decision of the divisional society, he should petition the divisional society for a rehearing at which the new evidence can be presented. If the divisional society refuses to hear any such new evidence, the reasonableness of that decision may be reviewed by the Board at the review proceeding, but not the merits of the evidence itself. The A.O.A. Board operates at a review proceeding solely in an appellate capacity and the initial responsibility for hearing and evaluating the charges and evidence rests upon the divisional society before which the charges were initially filed and which has conducted the original hearing. A representative of a divisional society or a member who is present may be questioned by the members of the Board after the record of the ethical hearing of the divisional society has been made a part of the A.O.A. record. These questions shall be directed at interpreting and elucidating information concerning the record presented to the Board. The questions should not seek to obtain new evidence.

Upon the conclusion of the review proceeding the Board will reach a decision, and if the Board shall concur in the action of the divisional society, such member shall be suspended for the same period of time or expelled from the Association

upon the same basis as in the decision of the divisional society. If the Board's decision does not concur, it will advise or recommend such further action, if any, as the record of the proceeding indicates should be taken by either the Board, Committee, or the divisional society.

Membership in the A.O.A. is a valuable and honored privilege and a matter of pride to the member. Thus, proceedings which affect membership status must be conducted in accordance with rules and regulations. Failure to conform to such rules and regulations either will prevent the A.O.A. from concurring in the action of the divisional society or will result in the divisional society decision being sent back to the divisonal society for further action which will make the record and decision conform to A.O.A. requirements. The divisional society should recognize that the A.O.A. may review only disciplinary actions which conform to the A.O.A. general procedures and which involve a violation of the A.O.A. Code of Ethics. Further, when evidence is insufficient or when the member concerned has not been notified, the A.O.A. will not review the decision. Therefore, when a divisional society desires that a particular proceeding be reviewed by the A.O.A., it is in its interest to conform to the general provisions of the Guide for Administrative Procedure, insofar as possible under its own rules and regulations.

DEPARTMENT OF PUBLIC AFFAIRS

DONALD M. DONISTHORPE, D.O.
Chairman

Bureau of Public Education on Health

ROSWELL P. BATES, D.O.
Chairman

Annual Congress on Medical Education and Licensure

▶ The Palmer House Hotel in Chicago will again this year, from Sunday, February 10, through Tuesday, February 12, be the scene of the Annual Congress on Medical Education and Licensure. Each year the participation of the Federation of State Medical Boards of the United States, the American Association of Basic Science Boards, and the Council on Medical Education and Hospitals of the American Medical Association in the Congress insures a program of high caliber. In the past, representatives of the osteopathic profession attending the Annual Congress have, by and large, been only those doctors serving as members of boards of medical examiners. Within the past few years, however, an increasing number of D.O.'s either serving on boards of osteopathic examiners or for other reasons interested in problems pertaining to the education or licensing of physicians and surgeons have attended this important meeting. While only members of medical and basic science boards have the right to speak or vote during the proceedings, other physicians or lay persons are invited to attend all the sessions. D.O.'s other than members of boards of medical examiners may, therefore, gather the same information and listen to the same important presentations or discussions as those D.O.'s serving on medical licensing boards.

The program will commence on Sunday morning, February 10, with a conference relating to graduate medical education for general practice. This subject will cover both undergraduate and graduate education for general practice. The points of view of specialists in internal medicine, pediatrics, surgery, obstetrics, gynecology, and psychiatry regarding general practice will be presented. Upon the conclusion of their presentation, the speakers will act as a panel for discussion purposes. Sunday afternoon will be devoted to the regular business meeting of the Federation of State Medical Boards of the United States. At this meeting there always come up for discussion important questions and problems pertaining to the relation of the Federation to the activities of state medical licensing boards.

The Monday morning program will be devoted to a symposium on medical education for the future. This program will be directed at principles or objects having lasting values in medical education as contrasted to those aspects having a more transitory or temporary value. Various aspects of medical education will be covered, including medical education as a cultural experience, the importance of and concern over natural and physical sciences remaining basic in the education of the physician, and the need for structuring medical education to reflect medical research adequately in both knowledge and attitudes. The Monday afternoon session will be devoted to the subject of postgraduate medical education. This will not be a stereotyped presentation, but will include new developments emenating from medical school and state medical society postgraduate programs, experiments in the role that can be played by community hospitals, and the general pattern which postgraduate medical education seems to be developing. It is apparent that the postgraduate education program involves a coordination of all groups, institutions, or schools having a part in the training of physicians and the providing of medical and surgical care. The annual banquet of the Federation of State Medical Boards will be held on Monday evening.

The program of the Federation on Tuesday will revolve around the general theme of the re-evaluation of the licensing examination. This subject will be one of particular interest to board members as it will cover discussions and analyses of the types of examinations which today should be conducted by boards licensing physicians and surgeons. The new program of the Federation directed at keeping modern the examining procedures and contents of examinations and making more uniform the level of examining standards by the various licensing boards will be covered. From the standpoint of board members, the program of the Federation this year will probably be more interesting and challenging than has been its program in the past several years.

A complete copy of the program of the Annual Congress is not yet available. As soon as it is available, notice of it will be directed to all of those doctors serving on licensing boards. It is the hope of the Bureau of Public Education on Health that not only will its members be present but also that all D.O.'s whose positions or duties affect the standards of education and licensing for physicians and surgeons will attend.

Current Literature

Causes and prevention of developmental defects

▶ ACCORDING TO Theodore H. Ingalls, M.D., writing in the July 14, 1956, issue of *The Journal of the American Medical Association,* not all congenital defects are genetically determined at conception. Extensive researches conducted at the Harvard School of Public Health indicate that most congenital anomalies originate as fetal manifestations of critical stress on the mother in pregnancy.

Using pregnant mice as animal models and using lack of oxygen as an example of a nonspecific form of environmental stress, researchers were able to produce a vast panorama of deviations in newborn offspring by inducing hypoxia at different stages in gestation.

These studies would indicate, therefore, that a large class of congenital defects is preventable. Anomalies occasionally due to rubella or to some of the other childhood diseases could be prevented if children were allowed to get these infections naturally and develop natural immunity in youth. The prevention of influenza during pregnancy, perhaps by vaccination before the event, is certainly worthy of consideration. The effect upon the maternal organism of a constellation of adverse factors, such as anemia, diabetes, hypothyroidism, organic heart disease, systemic hypertension, retroflexion, and tumor of the uterus, cannot be underestimated. Likewise, elective airplane flights, operations, and dental procedures of magnitude should be undertaken before pregnancy or postponed until after delivery.

Long-term strategy leading to partial control of congenital anomalies would indicate a combined front of laboratory, clinical, and epidemiologic methodologies. Congenital defects should be attacked with the same intensity as is now being directed at poliomyelitis and other causes of disability.

Proctosigmoidoscopy in the general physical examination

▶ THROUGH THE TECHNIC of routine sigmoidoscopy, physicians have a unique opportunity to detect early cancer and precancerous neoplasms. For this reason, E. L. Crumpacker, M.D., and associates propose that proctosigmoidoscopy, the only accurate method of polyp detection, be made a part of every complete adult physical examination. To support this contention, they present, in the September 1956 issue of the *Archives of Internal Medicine,* the findings from a large number of proctosigmoidoscopic examinations of a group of unselected patients.

The Greenbrier Clinic where the study was conducted is a diagnostic medical clinic where approximately two thirds of the patients are examined under company-sponsored executive health programs. A proctosigmoidoscopic examination is part of the general physical examination of all male patients. A total of 5,158 examinations has been made on 2,401 men with the following results:

Rectal and/or sigmoidal polyps were discovered in 161 patients, 6.7 per cent of all patients examined. Most of the polyps were discovered on the first examination, although a high yield was also obtained on the second annual examination. Thereafter, there was an almost constant find of a little more than 2 per cent on each subsequent annual examination. In 14 patients, polyps were found after previously discovered polyps had been removed. In 113 instances, the polyps were solitary; in 48 instances two or more were found. Location of the polyps ranged from 3 to 25 cm. from the anal margin. The average depth was 12.2 cm. Only four were felt on digital examination. Of the 161 patients, 17 gave a history of rectal bleeding.

Double-contrast barium-enema studies were made in 110 of the 161 patients in whom polyps were discovered. Fourteen had definite polyps at a higher level in the colon; 6 had probable small polyps; 1 had annular carcinoma.

When a polyp is discovered there is no way of knowing whether it is malignant or benign, except by microscopic study. While size of the polyp may bear some relationship to the possibility of its malignancy, it is not a reliable criterion. In this study, approximately 5 per cent of the neoplasms were found to contain invasive carcinoma, and at least an additional 5 per cent contained carcinoma in situ or atypism. Moreover, it is generally agreed among serious students of the subject that adenomatous polyps of the large bowel are potentially malignant.

On the basis of this study the authors conclude that proctosigmoidoscopy will detect more potentially serious but correctible disease than most routine procedures and therefore should be a part of every general examination of adults which makes a pretense of completeness.

Endocrine treatment of climacteric osteoporosis

▶ THE INCIDENCE OF osteoporosis in older patients is unknown, but mounting evidence suggests that it is much more prevalent than has been realized. In the August 1956 issue of the *Journal of the American Geriatrics Society,* William H. Perloff, M.D., Joseph H. Boutwell, Jr., M.D., and Roberto Maas, M.D., discuss and evaluate current endocrine therapy in climacteric osteoporosis.

Included in this series were 62 climacteric patients (50 women and 12 men) with indisputable x-ray evidence of moderate to severe osteoporosis of the spine; 6 normal control subjects (3 women and 3 men between the ages of 25 and 35 years); and 3 postmenopausal women who had amenorrhea of from 5 to 10 years' duration but no evidence of osteoporosis. Causes of decalcification other than steroid deficiency were systematically excluded. Routine laboratory determinations included a complete blood count, urinalysis, fasting blood sugar and serum cholesterol levels, 24-hour thyroidal I^{131} uptake and 24-hour urinary titers of estrogens, gonadotropins, 17-ketosteroids and corticoids. In every case the diagnosis of the climacteric was confirmed by the finding of elevated urinary gonadotropins.

Calcium balance studies were conducted as outlined by Albright and Reifenstein. Patients were put on a low-calcium diet for 3 days prior to the onset of the study, with a daily calcium supplement of 650 mg. This yielded a total daily calcium intake of about 750 mg. The calcium tolerance test was carried out according to the method of Schilling and Laszlo, and patients were maintained on the low-calcium diet for at least 2 days prior to the test. Similar studies were conducted on the 3 menopausal women with no evidence of osteoporosis,

and calcium tolerance tests were performed on the 6 normal control subjects.

The estrogen-androgen tablet administered therapeutically contained 1.5 mg. of piperazine estrone sulfate and 5 mg. of methyltestosterone. In addition to endocrine therapy, patients were put on a careful diet, well-fitting back braces were worn for at least 3 to 6 months, and extension exercises directed toward the spinal musculature were undertaken. Side-effects from the hormones were few: 2 women showed evidence of temporary uterine staining, and 3 others complained of some oiliness of the skin.

Following endocrine therapy, relief of back discomfort was dramatic. Patients uniformly experienced partial amelioration of symptoms within 2 to 4 weeks and complete or nearly complete relief from pain within 4 to 6 weeks. In addition, the male patients who received six 75-mg. pellets of testosterone and one 25-mg. pellet of estradiol implanted subcutaneously at the angle of the scapula, rather than the oral dosage, experienced improvement in strength, sense of well-being, and sexual drive. One unexpected finding was that nonosteoporotic patients lost, on the average, as much calcium as those with obvious roentgenologic and clinical signs and symptoms of osteoporosis.

Although relief of back pain may be expected within weeks following administration of an estrogen-androgen combination, x-ray evidence of improvement cannot be anticipated probably for years. It would appear, therefore, that while back pain may result from vertebral fractures and pressure on the spinal nerves, the usual discomfort is the result of withdrawal of calcium from the spine.

On the basis of this study, the authors suggest careful consideration of the possibility of routine administration of an estrogen-androgen tablet every day or every other day to postclimacteric men and women in order to avoid or delay the development of osteoporosis and possibly other degenerative metabolic diseases.

Arlidin: a clinical evaluation

► THERE IS A GREAT need in the management of chronic occlusive arterial diseases for an effective oral vasodilator to control the omnipresent symptom, intermittent claudication. In the August 1956 issue of *Annals of Internal Medicine,* Irwin D. Stein, M.D., evaluates the effect of a recently introduced vasodilator drug, Arlidin, on 220 patients.

The criterion for selecting the 220 patients was the presence of intermittent claudication. Patients with pain at rest were excluded. Peripheral arteriosclerosis was the common etiologic factor in 212 patients, and thromboangiitis obliterans was the etiologic factor in eight. Each patient was given a complete general and peripheral vascular examination to determine his vascular reserve. The examination included tests for the presence of pulses, oscillometric and skin temperature readings, response to reactive hyperemia, and exercise tolerance. The degree of exercise tolerance was determined by the number of "toe stands" the patient could do to count (1 per second) and by the distance the patient could walk on level ground at normal pace before claudication caused a halt.

Oral Arlidin therapy was commenced with one tablet (6 mg.) three times a day for a week. If no change in symptoms took place during this period, the dosage was increased to two tablets three times a day. Noticeable improvement was usually seen by the second and third weeks of treatment. Using the two categories of moderate and marked improvement, the investigators found that of the patients with peripheral arteriosclerosis leading to acute or to chronic development of symptoms of muscle ischemia, 112 showed moderate improvement and 32 showed marked improvement. Sixty-eight patients in this group showed little or no improvement. Of the 8 patients with thromboangiitis obliterans, 2 showed moderate improvement, and 6 showed marked improvement.

In a special group of 35 patients who were selected because they had patent femoral arteries which could be used for injection of Arlidin, plethysmographic determinations of blood flow changes in the calf were made. The results provided an objective and quantitative test of the dilating properties of the drug. Single doses of 6 mg. of Arlidin injected intra-arterially produced a marked increase of blood flow in the calf muscles varying from 200 to 800 per cent, depending upon the vascular reserve present. The average increase was 300 to 400 per cent which approximates the maximal blood flow possible in the area, measured by a degree of reactive hyperemia. The intra-arterial injection of Arlidin did not produce the bright skin flush associated with other vasodilators such as histamine, Priscoline, or papaverine. This would seem to indicate that, considering the marked increase in total blood flow in the test area, Arlidin must produce a tremendous increase in blood flow to muscle.

No side or toxic reactions were seen with the use of Arlidin either orally or intra-arterially.

Relationship of significance of wound to pain experienced

► THE FREQUENCY OF pain severe enough to require a narcotic was studied by Henry K. Beecher, M.D., in 150 male civilian patients, and the findings were contrasted with similar data from a study of wartime casualties. The purpose was to test the hypothesis that suffering consists of two principal factors: the initial sensation and the reaction to sensation. The results are published in the August 25, 1956, issue of *The Journal of the American Medical Association.*

Every effort was made to have the two groups comparable in essential respects and to assure that existing differences, such as age and past illness, between the two groups did not influence the results. The chief difference between the two groups, therefore, was in the anxiety level, in the attitude of the patient, and in his reaction to the wound. To the soldier, injury meant release from the almost overwhelming anxiety of sudden death on the battlefield. To the civilian, injury was viewed as a disaster and was fraught with anxiety.

Despite extensive tissue trauma resulting from battle wounds, only 32 per cent of the soldiers interviewed 7 to 12 hours after being wounded reported pain severe enough to necessitate narcotics. Among the civilian patients, 83 per cent requested narcotics following surgery. Age, type of anesthetic agent used, time lapse between trauma and interview, and duration of the pathologic state seemed to have little effect upon the over-all suffering among civilian patients.

Since this study substantiates the theory that reaction to the original pain sensation is a most important factor in suffering, it would seem that the employment of experimental pain in man as a technic to test the analgesic power of various agents is of questionable value. The reaction of an animal to experimental pain is likely to be the same as the human reaction to pathologic pain, however, since the animal cannot differentiate between the two.

A new method of treating emotionally induced illness

► ACCORDING TO John A. Schindler, M.D., writing in the September 1956 issue of *Postgraduate Medicine,* at least half the patients seen in doctors' offices are there primarily because they are suffering from functional illness. Unfortunately, patients with emotionally induced illness generally receive the poorest treatment of any group of patients, a fact which is as upsetting to the doctor as to the patient and which results in condemnation of the medical profession in general.

Treatment for functional illness usually falls into three general categories: (1) "substitution therapy," in which the doctor gives an improper but easily understood organic cause for the patient's illness which satisfies him for a time but in the end usually drives the patient to another doctor, (2) "nerves-plus-sedatives" approach, in which the doctor frankly states that there is nothing wrong with the patient but his

nerves and prescribes a sedative, and (3) adequate traditional psychotherapy, which may be effective but usually is impractical because of the time and expense involved. The second approach can be successful only if all doctors use it; too many do not.

A fourth approach to the treatment of emotionally induced illness is suggested by the author. Through the use of an automatically operated slide projector and tape recorder, psychosomatic patients are taught the whys and wherefores of functional illnesses and what to do about them. The entire presentation takes from 15 to 20 hours and is witnessed, where possible, by both the patient and his or her spouse in a pleasant, private room.

Before the program is undertaken, however, the confidence of the patient must be won. A meticulous physical examination is made and a complete history is taken. The patient is also given one of the Cornell medical indexes to fill out. The answers make it possible for the physician to tell at a glance what the patient's fears are. Following the physical and written tests, the patient returns to the doctor's office. Each test is briefly reviewed. The patient is then told that his is a "functional disease" and that the doctor would like the patient and his wife (or husband) to return the next day for a fuller explanation.

The first audiovisual presentation lasts 3 hours and is a general expression of functional disease. About forty of the most common syndromes seen in emotionally induced illness are shown. The life situation is presented first; then, the physiologic changes which are produced are demonstrated, often through the use of cartoons and diagrams.

After the first session, about 95 per cent of the patients are convinced that they have a functional illness. Thereafter, the patient and his spouse come back at weekly intervals for an hour or 2 of additional audiovisual presentation. During the next 12 to 15 hours the causes of emotional stress are described and the resulting emotionally induced illnesses explained (not all patients are shown the same material). The final sessions are devoted to showing practical ways of meeting ordinary immaturities and of filling the lack of basic psychologic needs. Finally, the patient is given a copy of "How to Live 365 Days a Year."

If the patient remains symptom-free and does not consult a physician for 1 year, his improvement is scored as plus 4. If the patient does not go back to the physician for 1 year but continues to have some symptoms but refuses to worry about them, his improvement is rated as plus 2. If the patient continues to have symptoms and returns frequently to the doctor, he is considered unimproved. In the last group are the patients usually referred to a psychiatrist. In this present study, 65 per cent of the patients undergoing audiovisual therapy were rated plus 4. Only 10 per cent remained unimproved.

Management of the "frozen" shoulder

▶ IN THE JULY 28, 1956, issue of *The Journal of the American Medical Association*, G. Edmund Haggart, M.D., Robert J. Dignam, M.D., and Thomas S. Sullivan, M.D., describe a successful program for the management of "frozen" shoulder based on a subjective and objective study of 97 patients who had been so treated without complication.

The etiology of frozen shoulder still is not clear. The condition occurs most often in middle life and is seen in women more than in men. Consistently it is observed following prolonged dependency of the upper extremity. Most patients list minor contusion or sprain as the cause of disability; however, frequently no specific incident is reported. With the beginning of pain and discomfort, the patient limits active use of the arm as far as motion of the shoulder joint is concerned. Eventually the symptoms subside and a certain degree of motion returns, to be followed by definite limitation of abduction and external rotation. Any effort to increase the range of motion results in intense pain.

The treatment recommended by the authors consists of manipulation of the shoulder joint in progressive stages with the patient under anesthesia following an intensive exercise program supervised by a skilled physical therapist. Hospitalization is required for this procedure, the average length of stay being 10 days. Occasionally, the patient returns to the hospital for 48 hours to have the manipulation repeated.

In order to determine the long-range effectiveness of this regimen, a follow-up study was undertaken. Each of 230 patients who had been hospitalized for treatment was sent a questionnaire. Replies were received from 153 persons, 97 of whom reported to the clinic for an examination. The evaluation was based on (1) observation over a long time, (2) physical examination of the patient's shoulder, and (3) a subjective and objective opinion of the end-results. In the entire group of 153 patients, the longest period of observation was 9 years, the shortest was 4 years, and the average follow-up time was 6 years. Results were classified as (1) excellent—no shoulder symptoms and normal range of shoulder motion; (2) good results—normal shoulder motion with occasional discomfort; (3) fair results—recurrent mild shoulder discomfort with normal motion at the shoulder joint; and (4) poor results—limitation of shoulder motion and/or constant pain, with patient unable to resume usual activities.

In this study, 82 per cent of the patients reported subjective results of good or excellent. The investigators found good or excellent results in 95 per cent and therefore conclude that closed manipulation of a frozen shoulder is a worth-while and effective form of treatment. There were no complications in this series.

Postoperative wound infection

▶ A RISE IN THE incidence of postoperative wound infection in a surgical unit of St. Bartholomew's Hospital, London, led to an inquiry into the various causes of bacterial infection and a suggestion for remedying them. The report by R. A. Shooter, M.D., and associates is published in the September 1956 issue of *Surgery, Gynecology & Obstetrics.*

Sources of bacterial infection include human carriers, nonsterile supplies and equipment, and air-borne bacteria. Careful surgical preparation and technic can usually prevent human and instrument contamination. To counteract air-borne bacteria, however, proper ventilation is necessary to insure aseptic conditions.

In this present study, samples of air from the operating theater, wards, and passage were taken with a slit sampler, and the bacteria present were typed and counted. In one 4-month period, 26 different types of staphylococci were isolated. By comparing the staphylococci found in the patients' wounds with those found in the various air samples, it was found that the bacteria could have come from the theater, the wards, or the passage between. A study was then made of the ventilating system of the operating room. Tests with titanium chloride smoke showed that the air suction system used to heat and ventilate the operating room was pulling air under the doors into the operating room from the passage outside. A reversal of the air flow resulted in prompt reduction of bacteria in the air and a sharp fall in the incidence of wound infection.

Another factor believed to be of importance in cutting down wound infection was the avoidance of zones of still air over the operating table. The ideal ventilating system should provide a slight positive pressure to prevent ingress of bacteria-laden air currents and at the same time eliminate any still air which might allow dust particles to settle over the wound area.

The use of anticoagulants

▶ ANTICOAGULANTS ARE now extensively used in many fields of medicine with varying degrees of success. A general evaluation of the different phases of anticoagulant therapy is given in the September 1956 issue of *The Medical Clinics of North America* by William T. Foley, M.D., and Irving S. Wright, M.D.

The first conditions to be successfully treated with anticoagulants were phlebitis and pulmonary embolism, and the value of anticoagulants in these conditions is well established.

A study of 24 patients with recurrent or migratory phlebitis who were treated with continuous Dicumarol administration indicates that anticoagulants are also useful in reducing the number of thromboembolic episodes in these patients.

Patients with rheumatic heart disease, mitral stenosis, and auricular fibrillation often extrude emboli to the lungs and to the peripheral circulation. Twenty-nine carefully selected patients with rheumatic heart disease were placed on long-term anticoagulant therapy with marked reduction in the number of thromboembolic episodes.

A cooperative clinical study of the American Heart Association has shown conclusively that mortality and morbidity from thromboembolic phenomena following myocardial infarction can be greatly reduced by the proper use of anticoagulant drugs. Because it is impossible to predict during the early stages the severity of myocardial infarction, anticoagulants should be administered in all cases unless there are contraindications.

Anticoagulants are also of value in combating thrombosis in capillaries and veins while awaiting collateral blood flow to be established following acute arterial occlusion. The propagation of the embolus or thrombus can also be halted by prompt use of anticoagulants.

The first experiences with the use of anticoagulants in treating cerebral embolus were reported in 1945. A recent study of 57 patients who suffered 205 intravascular clots, including 81 in the brain, before commencement of anticoagulant therapy and only 23 thromboembolic episodes, including 6 in the brain, after therapy indicates that anticoagulants are of value in preventing thromboembolic complications following cerebral thrombosis. It should be noted that many of the 23 episodes occurred during interruptions in treatment. The utmost care must be taken, of course, to differentiate cerebral hemorrhage from cerebral thrombosis before administration of anticoagulants.

Dramatic results also were seen in a group of 31 patients who had emboli to the brain from fibrillating rheumatic hearts. Prior to the start of anticoagulant therapy, these patients suffered a total of 137 thromboembolic episodes (46 cerebrovascular); after anticoagulant therapy was started, the total number of episodes suffered was 11, 4 of which were cerebral.

A study of 19 patients with generalized arteriosclerosis showed a sharp reduction in the number of thromboembolic episodes following the use of anticoagulants. However, as in patients with rheumatic heart disease, there is a striking relationship between the recurrence of thromboembolic incidents and the intermittent use of anticoagulants.

The use of anticoagulants to prevent impending cerebral infarction is still in the experimental stage. There is evidence to suggest that serious clots have been avoided in patients with impending infarction following prompt administration of anticoagulants.

Marked improvements have been made in recent years in the technics of administering anticoagulants. Also, more and better drugs are available, as are improved antidotes. Before anticoagulant therapy is undertaken, however, the physician must (1) master the technic, (2) have available a reliable laboratory, (3) select only intelligent, cooperative patients, (4) test the patient frequently, (5) always have antidotes on hand, and (6) always be available for emergencies.

Hemostatic properties of synthetic serotonin

▶ IN AN ATTEMPT TO evaluate the hemostatic properties of synthetic serotonin, a total of 22 patients was studied by Mario Stefanini, M.D., and Sergio I. Magalini, M.D. The results are reported in the July 1956 issue of the *Archives of Internal Medicine.*

Serotonin (5-hydroxytryptamine) creatinine sulfate (5-HT) is a constituent of serum and platelets and has many and complex biologic functions, some of which are connected with the mechanism of hemostasis. Serotonin is entirely inactive in the mechanism of blood coagulation, however.

Because some investigators had reported the control of clinical bleeding, shortening of bleeding time, and increased capillary resistance following parenteral administration of serotonin to a few patients with primary or secondary thrombocytopenic purpura. It was decided to administer serotonin to a larger number of patients with various hemostatic abnormalities. Of the 22 patients studied, 7 were normal, 5 were suffering from primary vascular defect, and 10 from various forms of thrombocytopenia.

The 7 healthy persons received intravenous infusion of serotonin creatinine sulfate over a period of several hours. Slowly flowing infusion caused significant reduction of the bleeding time in 4 subjects. There were no appreciable effects on the platelet count or the rate and degree of clot retraction. Blood clotting time also was unmodified.

Three patients with thrombocytopenic purpura of the idiopathic variety and 7 patients with a secondary type of thrombocytopenia were treated with intravenous injections of serotonin over a 4-hour period for 2 consecutive days. The drug was then given intramuscularly at 4-hour intervals for from 4 to 7 days. Again there was no significant improvement in bleeding manifestations. Abnormal platelet count, bleeding time, tourniquet test, and prothrombin utilization remained unmodified.

Five patients with vascular pseudohemophilia were given serotonin. Four did not present bleeding at the time of study while 1 presented profuse oozing following a dental extraction. Of the 4 not presenting bleeding, 2 received serotonin intravenously; the other 2 received intramuscular injections. Intravenous administration was followed by temporary reduction in bleeding time. Intramuscular administration produced erratic and fleeting effects. Clot retraction, platelet count, and prothrombin utilization during clotting remained unmodified. The patient with active bleeding received serotonin intravenously. His bleeding time was reduced from 18 to 7 minutes, but there was only mild effect on the bleeding manifestations.

Undesirable side-effects were experienced following serotonin administration. Rapid intravenous administration of the drug resulted in severe burning pain along the course of the vein for a distance of 5 to 7 inches in 3 patients. In two instances, local venous pressure was increased so that there was reflux of blood into the afferent tube. One patient fell into a deep sleep following intravenous infusion and was aroused with difficulty 1 hour later. Ten hours later this same patient developed generalized urticaria which lasted for 24 hours. Several of the patients receiving the drug intravenously felt flushed and nervous during and immediately after suspension of the infusion.

On the basis of this study, it is concluded that the hemostatic properties of serotonin in various hemostatic disorders are unimpressive and that the use of serotonin in thrombocytopenic states is futile.

Chemotherapy in child psychiatry

▶ IN THE SEPTEMBER 15, 1956, issue of the *New York State Journal of Medicine,* Lauretta Bender, M.D., and Sol Nichtern, M.D., discuss a number of chemotherapeutic agents that have been found useful in the management and treatment of emotionally disturbed children at Bellevue Psychiatric Hospital.

Chlorpromazine has proved very valuable in the emergency management of the acutely disturbed and agitated child. It has a sedative effect on the child yet leaves him easily arousable, and it often relieves accompanying anxiety. The barbiturates are highly effective therapeutic agents for children presenting agitated behavior associated with organic brain disease.

The most effective group of drugs for prolonged use in the treatment of emotionally disturbed children comes from the broad antihistamine family. Although results varied, favorable clinical experiences were obtained with Benadryl, Thorazine, Phenergan, Frenquel, and Bonamine. Benadryl proved to be the most efficacious in those patients with primary behavior disorders and impulsive behavior. This kind of impulsive action seems to be of neurogenic origin, and Benadryl appears to

dampen disturbing internal stimuli. Thorazine and Phenergan are more effective in the schizophrenic child, while Bonamine appears to be useful in children with spatial disorientation. Frenquel helps decrease impulsivity and integrates total functioning. It often softens the presenting symptomatology of the disturbed child and makes him more amenable to other therapeutic procedures and routines.

Best experiences with the amphetamines (Benzedrine and Dexedrine) were found to be with neurotic behavior patterns. Most of the children became quieter, more cheerful, and relaxed. Mood swings decreased and better socialization occurred. The patients seemed to experience a relief of tension and a temporary escape from conflict and anxiety.

Electroencephalographic studies of delinquent and behavior-problem children suggest the existence of an underlying abnormality in brain function in a relatively high percentage, even though the majority of these children do not present clinical evidence of convulsive disorders. Children with organic brain disorders may show a multiplicity of psychologic distortions and maturational lags which disrupt normal personality development. It is in these children that the judicious application of chemotherapeutic measures proves so useful. Dilantin, barbiturates, and other anticonvulsants have often produced favorable responses in the psychiatric management of emotionally disturbed children with organic features.

Reserpine has received considerable attention because of its application in adult psychiatry. The drug's limited use in children would indicate a varying response. When used with anticonvulsant therapy in epileptics, it seemed to reduce further the number of seizures and, in some instances, resulted in better behavior. Improvement was also noted in the performance of mental defectives. However, occasional adverse disturbance in homeostasis was encountered.

Chemotherapy is a rapidly expanding field, and experiences would suggest that it has an important role in the proper management of the emotionally disturbed child.

BOOK REVIEWS

▶ PRACTICAL PEDIATRIC DERMATOLOGY. By Morris Leider, M.D., Associate Professor of Dermatology and Syphilology, New York University Post-Graduate Medical School; Visiting Physician, Bellevue Hospital; Associate Attending Physician, University Hospital, New York University-Bellevue Medical Center; Diplomate of the American Board of Dermatology and Syphilology. Cloth. Pp. 433, with illustrations. Price $10.50. The C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, 1956.

This compact, 433-page book is a concise source of information on skin problems affecting children. It is devoid of the usual superficialities of the opinions of others and of the interspersing of bibliography. The author's statements of facts as he sees and interprets them, without apologies, make the book pleasantly readable. Emphasis is placed on the diseases most commonly found, and a table shows their usual location, along with their diagnostic features. Ten other tables are presented, dealing with diseases by body location, common laboratory procedures of importance to dermatologists, dermatologic terms, and so forth.

A rather interesting innovation is the use of blue paper for the section of the book devoted to a formulary of 101 dermatologic preparations. The contrast facilitates use of the formulary for therapy, and its coverage is such that, with few exceptions, the prescriptions could be compounded at most pharmacies. Where the use of proprietary preparations is expedient, they are named.

The material on tuberculosis is exceptionally well detailed, as is that devoted to the deep fungous infections. The last chapter gives a brief but complete resume of the minor or uncommon dermatoses of infants and children. The book is replete with excellent pictures. Eponyms are held to a minimum.

This text belongs in the libraries of dermatologists, pediatricians, and physicians in general practice, and it should be available to students and others taking part in the care of children.

A. P. Ulbrich, D.O.
D. Koprince, D.O.

▶ PSYCHOSOMATIC ASPECTS OF SURGERY. Edited by Alfred J. Cantor, M.D., Consulting Proctologist, Jersey City Medical Center, New Jersey; Director of Research in Proctology, Intestinal Research Institute, Flushing, L.I.; Permanent Secretary, International Academy of Proctology; Editor-in-Chief, American Journal of Proctology; and Arthur N. Foxe, M.D., Editorial Boards: Journal of Nervous and Mental Disease, Psychoanalytic Review and Archives of Criminal Psychodynamics. The Proceedings of the First Annual Meeting of the Academy of Psychosomatic Medicine, held in New York City, October 1954. Cloth. Pp. 220. Price $6.50. Grune & Stratton, 381 Fourth Ave., New York 16, 1956.

The Seminar which furnished the genesis for this volume must have been an excellent one, and it is a privilege for the rest of us to attend vicariously through the pages of this book. Both psychiatrists and surgeons made their contributions, in the form of several papers, and discussion is recorded with much of the fresh informality that characterizes a conference room.

Speaking for what must have been the consensus of the group, Hans Selye has keynoted the effort in his Foreword: "As far as I can see, there are two approaches to the study of psychosomatic medicine: the descriptive and the experimental. To my mind, the possibilities of the former have been exhausted. . . . The time has come for us to take the longer route, through the chemical, histologic and pharmacologic laboratories; this is more exacting, but it leads to a precise appraisal of measurable somatic changes caused by the psyche, and the recognition of mental manifestations elicited by identifiable humors of the body. This means that we shall have to roll up our sleeves and substitute work for mere speculation. Ours will be an arduous task, for tools and technics are still crude, but the effort is surely worthwhile: the goal is to lay foundations for psychosomatic medicine as a true natural science. . . ."

Perhaps it might be ventured that in this book, and in those recommended in the reference sections, such foundations are indeed being laid.

▶ ALLERGY IN CHILDHOOD. By Jerome Glaser, M.D., Assistant Professor of Pediatrics, the University of Rochester School of Medicine and Dentistry; Pediatrician-in-Chief, Genesee Hospital; Consulting Pediatrician, the Rochester General Hospital and St. Mary's Hospital, Rochester, New York. Regional Consultant, the Jewish National Home for Asthmatic Children, Denver, Colorado; Member of the Board of Regents of the American College of Allergists; Chairman of the Section on Allergy of the American Academy of Pediatrics. Cloth. Pp. 529, with illustrations. Price $12.50. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1956.

While the author does not claim this to be a complete text on pediatric allergy, it is still a well-organized compendium of

diagnosis and treatment in this field. A complete bibliography is given for each topic discussed, so that it may be studied in detail at will. The general impression of the book is one of quality—in points like four-color photographs of actual cases, high-grade paper stock, good indexing, systematic and practical diagnostic and therapeutic information, and addenda at the close of the volume which suggest additional directions for patients. The subjects treated are many; some, it is claimed, do not appear in any other volume on pediatric allergy. Among these are: insect bites and stings, eosinophilic pneumonopathy, chronic asthma, anaphylactoid purpura, the allergic tension-fatigue syndrome, and allergy to drugs and vaccines.

Concerned with a field where the literature is still sparse and, indeed, where the specialists are few, this volume should find a ready audience.

▶ THE PATHOGENESIS OF POLIOMYELITIS. By Harold K. Faber, M.D., Professor Emeritus of Pediatrics, and Director of Poliomyelitis Research Department of Pediatrics, Stanford University School of Medicine, Formerly Pediatrician-in-Chief, Stanford University Hospitals, San Francisco, California, Medical Director, Stanford Convalescent Home, Stanford, California. Cloth. Pp. 157, with illustrations. Price $5.00. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1955.

In the laboratories of Stanford University, Dr. Faber has been observing, cataloguing, and rechecking the mechanisms of infection and the path taken by the poliomyelitis virus during invasion and excretion. He has sought to answer many questions, including the nature of the virus, its paths in and through the body, the characteristic pathologic and clinical effects, the defenses of the body against it, and the probable effectiveness of immunization programs. He has been working on this project sponsored by the National Foundation for Infantile Paralysis, Inc. since 1940, and, although he has published some papers, this is his first full report.

The report is concise, almost terse. The findings may differ from or challenge the reports of others. However, he does not use space and time at attempted refutations, but rather gives a full presentation of his observations, his conclusions, and his reasons for them. In his own words, his aim has been "to formulate a unitarian concept of poliomyelitis infection and, with as little theorizing as possible, to correlate the established facts." In addition to the discussion of laboratory findings, concerning the disease, there is an excellent presentation of phenomena which permit better diagnosis—not only the detection of poliomyelitis in its early, preparalytic stages, but also the elimination of it in suspected cases.

The book is well organized, tightly written, and attractively produced. Pertinent charts, graphs, and drawings as well as photographs supplement the text. There is an extensive bibliography, and the index furnishes an efficient reference tool.

▶ PROGRESS IN PSYCHOTHERAPY. Edited by Frieda Fromm-Reichmann, M.D., Chestnut Lodge, Rockville, Maryland; Center for Advanced Study in the Behavioral Sciences, Stanford, California; and J. L. Moreno, M.D., Moreno Sanitarium, Beacon, New York; New York University, New York City. Cloth. Pp. 352. Price $8.50. Grune & Stratton, 381 Fourth Ave., New York 16, 1956.

In the technical details of his practice, the clinician is often tempted (or forced by lack of time) to overlook the broader aspects of his profession and see only the practical, day-to-day problems. The need for this cross-play of ideas, plus the exchange of recent information, came to notice among members of the psychiatric profession through the recently developed Section on Psychotherapy in the American Psychiatric Association. Work toward understanding and comparison of various philosophies of psychotherapy began for these specialists in symposia at their 1955 national conference. The material has been edited and expanded to form this book.

There are represented several contributors and as many viewpoints. Some of the information concerns the different schools of thought among persons interested in psychotherapy; some deals with methods of therapy; some tells of developments of the field in different parts of the world. Varying degrees of excellence are evident in the articles; however, the net result should be a renewed vision of the breadth of the field, and a decreasing tendency to "fail to see the forest for the trees." This readable volume should prove of value to anyone interested in the welfare of the whole patient, psyche and soma alike—though especially to the psychotherapist.

▶ A TEXTBOOK OF PATHOLOGY. By E. T. Bell, M.D., Emeritus Professor of Pathology in the University of Minnesota, Minneapolis, Minn.; Contributors, B. J. Clawson, M.D., Emeritus Professor of Pathology in the University of Minnesota; and J. S. McCartney, M.D., Professor of Pathology in the University of Minnesota. Ed. 8. Cloth. Pp. 1028, with illustrations. Price $14.50. Lea & Febiger, Washington Square, Philadelphia 6, 1956.

That this text is standard reference equipment for many physicians and standard learning equipment for many medical students is well attested by the publication of its eighth edition. Since 1952, when the last revision was made, another extensive task of rewriting has been accomplished, with changes in every chapter. Noteworthy among the new materials are the revisions in the sections on anemias, hemorrhagic diseases, diabetes, hemochromatosis, and renal diseases. The references to the literature have been reconsidered, to insure current interest and usage, and the explanatory notes which guide selection of related tests are still present and useful.

A well-proved virtue of this book is that it relates so closely to clinical medicine that there is small possibility of thinking in terms of two separate fields. Another favorite point is the liberal sprinkling of photographs and plates—and yet another is the careful and conservative way in which concepts are presented. This new edition embodies all of these advantages, plus the benefits of the latest in medical opinion and interest.

▶ THE RECOVERY ROOM—Immediate Postoperative Management. By Max S. Sadove, M.D., Professor of Surgery (Anesth.) and Head, Division of Anesthesiology, University of Illinois College of Medicine and the Research and Educational Hospitals; and James H. Cross, M.D., Clinical Assistant Professor in Surgery, University of Illinois College of Medicine. Cloth. Pp. 597, with illustrations. Price $12.00. W. B. Saunders Company, West Washington Square, Philadelphia 5, 1956.

World War II use of postoperative shock and resuscitation units focused attention on development of the recovery room in hospital service. In this book, which is a compilation of material in the field, a survey of the general principles and needs which lead to the establishment of a recovery room are considered. The authors discuss the methods of obtaining a recovery room—especially when funds are limited, the administrative policies governing its use, and the actual planning and details of management. Specific recovery therapy required in various types of operations is extensively treated, and a final chapter is devoted to nursing care.

These discussions are characterized by explanation of general principles involved and repeated presentation and listing of postoperative orders and technics. The book seems comprehensive, drawing together surgical knowledge, considerable thought regarding management principles, and a wide background of research and experience. Outlines and charts are utilized to emphasize and explain; illustrations are clear and detailed. Despite the use of contributions from 26 men, the style is even, and the content of assistance to anyone involved in surgery, hospital administration, or policy planning.

▶ THE MANAGEMENT OF MENSTRUAL DISORDERS. By C. Frederic Fluhmann, B.A., M.D., C.M., Clinical Professor of Obstetrics and Gynecology, Stanford University School of Medicine, San Francisco, California; Assistant Visiting Obstetrician and Gynecologist, Stanford-Lane Hospitals; Courtesy Staff, Children's and Mount Zion Hospitals, San Francisco, California; Fellow, American Gynecological Society; Past President, San Francisco Gynecological Society and Pacific Coast Obstetrical and Gynecological Society. Cloth. Pp. 350, with illustrations. Price $8.50. W. B. Saunders Company, West Washington Square, Philadelphia 5, 1956.

By giving deserved attention to the history, the physiologic basis, and the research findings regarding the endocrine and

ovarian influences on the menstrual phenomena, the author has produced a work which, in addition to being a guide for the general practitioner, offers excellent introduction for the specialty student. This theoretical background aids in integrating the many observations that follow in the discussion of the menarche, adolescence, and the menstrual, ovarian, and uterine cycles and their disorders as well as the climacteric and menopause. In addition to the recommended therapy discussed in each section, there is an appraisal of clinical usages and commercial preparations of sex hormones. Selected references are included at the end of each chapter. The index is extensive.

▶ HANDBOOK OF PHYSICAL THERAPY. By Robert Shestack, PH.G.R.P., P.T.R., Technical Director, Department of Physical Therapy, Washington County Hospital, Hagerstown, Maryland; Director, Department of Physical Therapy, and Consulting Physical Therapist, Kings Daughters Hospital, Martinsburg, West Virginia. Foreword by I. William Nachlas, M.D. Cloth. Pp. 212, with illustrations. Price $4.25. Springer Publishing Company, 44 E. 23rd St., New York 10, 1956.

This little volume is well titled "handbook." Its practical and compact nature makes it usable as a ready reference, both for the one who simply prescribes physical therapy and the one who practices it. The two main sections of the book concern themselves with modalities of physical therapy available, and suggested therapy for specific medical conditions. There are extra sections giving historical background of the science, suggestions for the physician who orders physical therapy, and a listing of movements produced by muscles. The bibliography is fairly complete, as is the indexing.

The author has written from the vantage point of 14 years' practical experience and an estimated 100,000 treatments. His work contains many observations based upon actual use of the methods he propounds. The scope of the book is fairly broad, although one could hardly expect so small a volume to give exhaustive coverage to the subject. However, it is a book that will be *used*.

▶ THE PSYCHOSOMATIC GENESIS OF CORONARY ARTERY DISEASE. By Don Carlos Peete, M.D., Associate Clinical Professor of Medicine, Lecturer in the History of Medicine, University of Kansas School of Medicine, Kansas City, Kansas. Cloth. Pp. 220, with illustrations. Price $7.75. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1955.

The relation between diseases of the coronary arteries and the emotional stresses that stem from insecurity, or a man's fear of his environment, is the fundamental theme of this compact volume. Psychosomatic disease is defined by the author as the result of circulatory disturbances, whether coronary, cerebral, renal, or gastrointestinal. Each of the six chapters is introduced with a Biblical inscription. The first chapter traces the history of our understanding of the circulatory system. The earliest observations of the pulse, described in "The Yellow Emperor's Classic of Internal Medicine" which has been traced back to 2697 B.C., are presented, as are the observations of other scholars through the centuries, up to the time of Morgagni.

The contributions of Heberden, Jenner, Parry, and Hunter to our understanding of angina pectoris comprise the second chapter, in which considerable attention is devoted to the life of John Hunter who for 20 years experienced repeated attacks and finally died of angina pectoris. The relation between his illness and his habitual emotional responses emerges strikingly not only from the biographical information that has been collected about him, but from the descriptions by his contemporaries of his working habits as well as his attacks.

The author presents his concept of the etiology of vascular disorders in the third chapter, after reviewing the important advances made in understanding the function of the autonomic nervous system. In the fourth chapter he offers a theory of the causes of arteriosclerosis, presenting many observations by investigators of the past. He stresses the importance of securing a full family history of the patient who has coronary arterial disease and incorporates twelve pertinent case histories into the fifth chapter. The final chapter is devoted to various phases in the management of coronary arterial disease. Specific drugs and dosages, diet, rest, and the use of tobacco and alcohol are discussed.

Many quotations from ancient and modern sources are interspersed throughout the book, which is well illustrated. Throughout the text the author stresses his own theory that an adequate religious philosophy plays an important role both in the treatment and prevention of coronary arterial disease.

▶ BASIC SURGICAL SKILLS. A Manual with Appropriate Exercises. By Robert Tauber, M.D., F.A.C.S., Assistant Professor of Gynecology and Obstetrics, the Graduate School of Medicine, University of Pennsylvania; Senior Attending Physician in Obstetrics and Gynecology, the Albert Einstein Medical Center; Chief in Gynecology of the Kensington Hospital; Diplomate of the American Board of Obstetrics and Gynecology. Cloth. Pp. 75, with illustrations. Price $3.75. W. B. Saunders Company, West Washington Square, Philadelphia 5, 1955.

That skilled and competent hands are the greatest tools of the surgeon is the principle that guided the preparation of this manual. The author introduces the training board, explains its preparation, and states that the student practices on this until he is proficient in each skill. Special care is given to the explanation of the tying of knots and their importance to high surgical standards. The text is terse but complete, and is paralleled by simplified but well-planned and labeled illustrations. The book is recommended for the use of all beginners.

▶ THE NEUROSES IN CLINICAL PRACTICE. By Henry P. Laughlin, M.D., Assistant Clinical Professor of Psychiatry, George Washington University School of Medicine; Head, Psychiatry and Neurology Division, Suburban Hospital, Bethesda, Maryland; Consultant in Psychiatry, Walter Reed Army Medical Center. Cloth. Pp. 802, with illustrations. Price $12.50. W. B. Saunders Company, West Washington Square, Philadelphia 5, 1956.

In the field of descriptive psychiatry, this volume contributes a wealth of illustrative material. There are sections on Anxiety, Defense Mechanisms, Phobic Reactions, Illusion, Conversion Reactions, Dissociative Reactions, Depression, Fatigue Reactions, Overconcern with Health, Obsessive-Compulsive Reactions, Neuroses following Trauma, and of course many specific topics and subheads in the various classifications. There is also quite a complete glossary of psychiatric terms and concepts, many suggested references for supplementary study, and adequate indexing for handy usage.

As is common in such texts, much more emphasis is given to the symptom than to the cure, but when treatments seem to be of proved benefit, they are included. Generally, the information is practical and well-balanced in content, as one might expect from a report of clinical experience.

The book is certainly of value to anyone whose primary interest is in psychiatry, and to anyone else who realizes the value of understanding which reaches beyond the somatic illness of his patients.

▶ A MODERN PILGRIM'S PROGRESS FOR DIABETICS. By Garfield G. Duncan, M.D., Clinical Professor of Medicine, Jefferson Medical College; Director of the Medical Divisions of the Pennsylvania Hospital and the Benjamin Franklin Clinic, Philadelphia. Cloth. Pp. 222. Price $2.50. W. B. Saunders Company, West Washington Square, Philadelphia 5, 1956.

The diabetic and his family will welcome this compact presentation of the disease and "how to live with it." Margaret MacDowell, heroine of the didactic narrative, learns how to understand and care for herself as a diabetic. She finds a great deal of satisfaction—and information—in helping fellow-sufferers. By acquaintance with Margaret and her friends the lay reader absorbs a great deal of tutelage in a near-painless fashion.

Besides the fairly clever blending of scientific fact with human interest which the main part of the book provides, there is an appendix with systematic reference material for diabetic self-care. There are charts, menus and recipes, instructions for tests and injections, and many bits of miscellaneous knowledge. Though the author in no way claims this book to be a substi-

tute for consultation with a physician, it may supplement his directions in ways that an office visit could not possibly provide so easily.

One might question the literary taste of adapting the title from John Bunyan's classic, especially since the only internal resemblance is "the ups and downs" of a diabetic's life. The chapter headings suggest figures of speech which are mostly quite foreign either to "Pilgrim's Progress" or a diabetic instruction manual, seeming to be chosen at random from the wealth of hackneyed phrases common to our language. However, the pragmatic value of this volume well outweighs its literary deficiencies, and the clinician might well be pleased to recommend it to his patients.

▶ THE CERVICAL SYNDROME. By Ruth Jackson, B.A., M.D., F.A.C.S., Clinical Assistant Professor of Orthopaedic Surgery, Southwestern Medical School of the University of Texas, Dallas; Attending Orthopaedic Surgeon, Baylor University Hospital; Formerly Chief of Orthopaedic Surgery, Parkland Hospital, and Instructor in Orthopaedic Surgery, Baylor University College of Medicine, Dallas, Texas. Paper. Pp. 130, with illustrations. Price $4.75. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1956.

The cervical syndrome is an elusive condition with a multitude of clinical manifestations. The present study, which is strongly reminiscent of osteopathic philosophy, stresses the relationship between unco-vertebral articulation and foraminal compression and the anatomic principles which govern projected localization of pain as related to the sympathetic nervous system and irritation of the cervical nerve root. Dr. Jackson makes an explanation of this in the opening sections. For the guidance of the practicing physician, she later describes the process of examination, lists guides to differential diagnosis, and explains various forms of therapy, their indicated use, and predicted results. Her text is strategically complemented by reproductions of roentgenograms, photographs, and drawings. Because this study serves to unify existing knowledge regarding the cervical syndrome, it should be examined by all practicing physicians and students.

▶ DISEASES OF THE CHEST. By H. Corwin Hinshaw, M.D., Ph.D., Clinical Professor of Medicine, Stanford University School of Medicine; and L. Henry Garland, M.B., B.Ch., Clinical Professor of Radiology, Stanford University School of Medicine. Cloth. Pp. 727, with illustrations. W. B. Saunders Company, West Washington Square, Philadelphia 5, 1956.

An extensive and detailed study of diseases of the chest, prepared in the light of the impressive progress made in this field during the past decade, has been prepared by two professors of Stanford University School of Medicine. Advances in the diagnostic and therapeutic technics have made it possible for surgeons to cope with thoracic ailments with an unprecedented margin of safety. The freedom of entry into the thoracic cavity has also enabled the roentgenologist to coordinate his indirect observations with the direct observations of the pathologist. A wealth of roentgenographic studies have been produced to aid students of medicine as well as men practicing in the profession in bringing their fund of knowledge up to date.

Four chapters are devoted to diagnostic procedures, including the taking of the clinical history and the evaluation of the complaints; the physical and bronchoscopic study of the patient; laboratory tests; and roentgenographic study of the chest. The segmental anatomy of the tracheobronchial tree is reviewed. A specialist in his field has prepared the chapter devoted to the measurement of pulmonary function. Pneumonia—bacterial, viral, and rickettsial—and the roentgenographic patterns of seven types of pneumonia are discussed in two chapters.

Pulmonary inflammation, pulmonary abscess, inflammatory and suppurative diseases of the bronchi, and postoperative pulmonary atelectasis are discussed. The chapter on aspirated foreign bodies has been prepared by a specialist. Thoracic injuries, diaphragmatic diseases, bronchial asthma and pulmonary emphysema, pulmonary cysts, bullae, and blebs, and mediastinal disease are discussed separately. Bronchial and intrathoracic neoplastic diseases receive special attention, as do pulmonary congestion, edema, and embolism. Seven chapters are devoted to tuberculosis, and one chapter each to pleural diseases, sarcoidosis, and the pulmonary changes that accompany collagen diseases.

The discussion of the history, pathogenesis, clinical manifestations, diagnosis, treatment, and prevention of coccidioidomycosis has been turned over to a specialist in this field. Actinomycosis, nocardiosis and North American, South American, and the so-called European blastomycoses are described. Histoplasmosis and some of the other pulmonary mycoses are presented separately. The final chapters of the book deal with parasitic and other tropical pulmonary diseases and with pulmonary diseases of occupational origin.

This careful study is conveniently presented, each chapter opening with an outline of its contents. Whenever appropriate, the chapter contents are also summarized at the end. The references that follow some of the chapters have been thoughtfully selected so as to round out a more complete understanding of the entities described. The volume should prove to be an invaluable aid to student and physician alike, constituting as it does the collaborative effects of a radiologist and an internist. Although the volume contains forty chapters, the contents of each are concisely written, clearly subdivided, and readably presented.

▶ HUMAN OVULATION AND FERTILITY. By Edmond J. Farris, Ph.D., Executive Director, Associate Member, The Wistar Institute of Anatomy and Biology. Cloth. Pp. 159, with illustrations. Price $6.50. J. B. Lippincott Company, East Washington Square, Philadelphia 5, 1956.

A decade of work, hypotheses, data correlation, check and control check has given the clinician and practitioner new theories of great practical value for the childless couple. The doctor has devised a new formula for calculating ovulation time, tested it extensively by laboratory observation, and proved it by a hearteningly high ratio of conceptions and full-term deliveries among his patients. Graphs on every aspect of his inquiry explain and document his conclusions. One chapter reports on cases in which his methods succeeded but where the technic of determining ovulation time by temperature graph was only 40 to 45 per cent effective. He presents two tests which give early proof of pregnancy. One, based on the color of the cervical mucosa, indicates pregnancy as early as the thirtieth day; the other, utilizing the rat hyperemia test, is reliable on the thirty-fourth day and further indicates any tendency of the woman to abort, thereby allowing preventive measures. Because he sometimes used both homologous and heterologous insemination, he reports on the reactions observed and recommends methods of approaching the subject. To further aid the practitioner, the volume is thoroughly indexed and a list of cited references is included.

▶ DYNAMIC PSYCHIATRY IN SIMPLE TERMS. By Robert R. Mezer, M.D., Senior Staff Psychiatrist, Community Clinic, Massachusetts Mental Health Center and Harvard Medical School. Foreword by Harry C. Solomon, M.D., Medical Director, Massachusetts Mental Health Center, and Professor of Psychiatry, Harvard Medical School. Paper. Pp. 174. Price $2.50. Springer Publishing Company, 44 E. 23rd St., New York 10, 1956.

The author has taught psychiatry to medical students and student nurses for many years and is well aware of the need for an adequate text. He also firmly believes that psychiatry can be made understandable. With wit, thoroughness, and a well-structured but informal lecture outline, the doctor has written a book which proves his theory. In simple English he presents and illustrates the major theories operative in psychiatry. Clear definitions are a hallmark of his book. Each concept is explained in fundamental terms and is redefined when it appears in a new or broader context. His treatment of the various disorders is made easy to follow by the device of contrasting the deviation with the normal pattern.

The author stresses the wide range of normal development. He begins by tracing a normal personality growth and closes with a section that points out ways in which application of simple psychiatric theories can offer a happier everyday life. To counter the popular charge of exaggeration made against

psychiatry, the author points out that in the majority of people the various personality patterns develop and are resolved without incident and that only occasionally does overemphasis or distortion of personality demand special treatment. The book —as a text or as an introduction for the lay reader—is confidently recommended.

▶ HISTAMINE: ITS ROLE IN ANAPHYLAXIS AND ALLERGY. by M. Rocha E. Silva, M.D., Department of Biochemistry and Pharmacodynamics, Instituto Biologico, Sao Paulo, Brazil. Foreword by Carl A. Dragstedt, M.D., Professor of Pharmacology, Northwestern University Medical School, Evanston, Illinois. Cloth. Pp. 248, with illustrations. Price $7.50. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill., 1955.

This volume is the first attempt in 25 years to assess the biological significance of histamine. Further, the publisher finds it to be the first comprehensive monograph on histamine in the English language.

The author's studies lead him to suggest that histamine is a basic tool for the study of the mechanisms which are responsible for anaphylactic shock and sensitization diseases in man. He discusses free and bound histamine, liberation of histamine in physiologic and pathologic conditions, the metabolism of histamine, the autopharmacologic problem of anaphylaxis and allergy, inhibition of histamine effects, and sensitization diseases. His efforts had their genesis in the observation that some snake venoms produce an effect similar to anaphylactic shock, and some actually release histamine under certain conditions. So, from the study of two apparently unrelated fields, that is, the mechanism of the action of snake venoms and of pure proteolytic enzymes, with the added knowledge about antihistamine agents, important contributions have been made.

This monograph by no means concludes the subject at hand; it presents laboratory findings carefully and clearly, with the hope that others will be stimulated to join in the study of the yet-unsolved riddles—enigmas which the author has at least helped greatly in clarifying.

▶ DISEASES OF THE LIVER. Edited by Leon Schiff, M.D., Ph.D., Professor of Clinical Medicine, University of Cincinnati, College of Medicine; Director, Gastric Laboratory, Cincinnati General Hospital. With a Foreword by Cecil J. Watson, M.D., Ph.D. Cloth. Pp. 738, with illustrations. Price $16.00. J. B. Lippincott Company, East Washington Square, Philadelphia 5, 1956.

Twenty-eight eminent American, English and Canadian doctors have contributed to this highly practical and comprehensive clinical and pathologic survey of the entire range of known diseases of the liver. The volume has been designed to meet the specific requirements of the specialist and surgeon, but at the same time deals with the topic at hand in broad enough scope to serve as a valuable tool in the hands of the internist or general practitioner.

The anatomic, physiologic, and biochemical aspects of the liver are reviewed in the opening chapters. Experimentally produced hepatic injuries are discussed. Liver function tests are classified; the indications for them are presented, and their limitations are defined, after which the individual tests and their uses are discussed. Needle biopsy of the liver as a diagnostic tool is dealt with in a separate chapter, in which the methods, the contraindications, the reactions and complications, and the clinical application are reviewed. Separate chapters delve into such problems as jaundice, portal hypertension, and hepatic coma. The pathologic aspects of hepatitis are discussed generally, and viral hepatitis, toxic hepatitis, and hepatitis associated with systemic infections receive particular and extensive attention. Portal, postnecrotic and biliary cirrhosis are dealt with in detail. Hemochromatosis, hepatolenticular degeneration, and syphilis of the liver are discussed in terms of their incidence, clinical features, pathologic aspects, pathogenesis, and treatment. The hepatic changes that are observed in circulatory failure are presented. The various neoplastic changes of the liver as well as hepatic abscess are reviewed. An entire chapter is devoted to the liver diseases that occur in infancy and childhood. Parasitic diseases of the liver and various diseases of the gallbladder and extrahepatic bile ducts are described, as is also amyloidosis of the liver.

Under each separate division of the text, the reader has access to a wealth of references to pertinent material in the literature. Reproductions of photomicrograms, roentgen films, and photographs of specimens are interspersed throughout the text, which also contains many tables and graphs to aid in the full understanding of the topics covered.

No one man nor small team could possibly have covered so complex a clinical problem in such painstaking detail. In keeping with this publisher's tradition, the accompanying index is an efficient guide for those who expect to use the volume as a standard source of reference.

▶ LABORATORY MANUAL IN PHYSIOLOGY AND ANATOMY. With Study Guide Questions and Practical Applications. By Ellen E. Chaffee, R.N., B.S., M.N., M.Litt., Assistant Professor of Nursing, University of Pittsburgh School of Nursing. Paper. Pp. 219, with illustrations. Price $2.00. J. B. Lippincott Company, East Washington Square, Philadelphia 5, 1956.

Designed as a guide to laboratory drill, this manual has good diagrams and work space. It offers many sample questions which test the application of theory to practical situations. Directions are concise, the form and outline good—the value, however, is in the student's use.

▶ SCURVY AS A SKELETAL DISEASE. A Comparative Study of Scurvy and Rickets, Clinically, Histologically, Histochemically, Biochemically and Roentgenologically. By H. J. Van Wersch, M.D., Heerlen (Netherlands). Cloth. Pp. 365, with illustrations. Dekker & Van De Vegt, Oude Gracht 206, Utrecht, Holland, 1955.

This thorough study of scurvy and the skeletal changes that arise from dietary deficiencies is based on investigations conducted by the author and his colleagues over a period of 15 years. The volume begins with discussion of the etymology of scurvy and a history of the disease.

An extensive study of one patient, giving the history, the results of laboratory studies, and roentgenograms of the chest, pelvis, arms and legs constitutes the second section of the volume. The child was seen by the author at the age of 14, after she had been bedridden for 4 years, and her case was followed up until she was 29.

The third and most extensive section of the book is a presentation of the histologic, biochemical, histochemical, and roentgen investigations conducted on normal, scorbutic, and convalescent guinea pigs and on normal, rachitic, and convalescent rats. A clearly presented and detailed summary of these experimental investigations follows. The final sections consists of a survey of the experimental animals studied.

The book is of particular interest because it is the fruit of a general practitioner's deep scientific interest in the problems of a single patient with whose severe and prolonged illness he became involved and ultimately succeeded in curing.

▶ SYNOPSIS OF GYNECOLOGY. Based on the Textbook Diseases of Women. By Robert James Crossen, M.D., F.A.C.S., Associate Professor of Clinical Gynecology and Obstetrics, Washington University School of Medicine; Associate Gynecologist and Obstetrician to the Barnes Hospital and the St. Louis Maternity Hospital; Gynecologist to St. Luke's Hospital; Section Head of Unit 1 (Washington University) Obstetric and Gynecologic Service, St. Louis City Hospital; Fellow of the Central Association of Obstetricians and Gynecologists, American Academy of Obstetrics and Gynecology, American Radium Society, and American Society for the Study of Sterility. Ed. 4. Cloth. Pp. 255, with illustrations. Price $5.25. The C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, 1956.

The fourth edition of the "Synopsis" reflects the revisions in the tenth edition of Crossen's "Diseases of Women." New concepts of disease, recent illustrations and photographs, new methods of diagnosis and treatment, and a new discussion of psychosomatic aspects of gynecologic care maintain the position of this manual as an excellent guide for the student or general practitioner who must be familiar with, but does not specialize in gynecology.